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THE RELATIONSHIP BETWEEN READING PROFICIENCY, BACKGROUND KNOWLEDGE, AND INFERENCING STRATEGIES

by

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A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES AND RESEARCH

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ABSTRACT

Reading comprehension is frequently defined in terms of a number of cognitive processes which are manifested in the attainment of meaning. This study investigated inferencing, one of the specified processes essential in reading comprehension. While no cohesive theory of inference was available, the first task was to develop such a theory to provide a framework for the study. A synthesis of the research and thought from the paradigms of cognitive psychology, sociology, and the philosophy of language with the investigator's own thinking comprised the theory of inference. Within this theoretical framework, a second purpose of the study was to identify the inferencing strategies utilized by very proficient and less proficient readers with different degrees of background knowledge.

Forty grade six students were divided equally into two groups (very proficient and less proficient readers) and were then divided into subgroups and assigned a set of three passages that were familiar or unfamiliar. Each passage consisted of six episodes dealing with a particular topic. After each student had read an episode he was requested to introspect and to tell the investigator what he was thinking and why. The entire session with each student was taped and transcribed. Ten inferencing strategies were identified which were found to be mutually exclusive based on factor analysis.

Results of the study showed that the total number of inferencing strategies used was not affected by the level of reading proficiency nor by the degree of familiarity of the passage content. The nature of the inferencing strategy utilized was the discriminating

feature. Those students who read the familiar passages and who were classified as very proficient readers furnished more extralinguistic information when elaborating upon their inferences, and tended to identify the main inference earlier in the text than did their counterparts. However, more important than either the level of reading proficiency or passage familiarity was the particular strategy used. Some strategies seemed to enhance the making of inferences while the utilization of other strategies had the opposite effect.

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Chapter I

INTRODUCTION

Comprehension is a term that has been in circulation for a number of years. It has been recognized within the last decade that this generic term is an active process relative to what an individual already knows. Comprehension is a set of procedures that involves selecting one's personal experiences or knowledge of the world as they relate to the surface structures of text to yield meaning. Attention has focussed on how the reader relates what has been accrued from the world around him to the visual information in the case of reading. It has been further recognized that reading comprehension involves complex cognitive operations about which little is still known. Cognizant that comprehension cannot be seen as an independent process but rather as a collection of processes identified as predicting, inferring, synthesizing, comparing, discriminating, generalizing, classifying, etc., it appears that in an attempt to understand "comprehension" one must first study each of these cognitive operations in some detail.

It was the main thesis of the study that inferencing is an essential process in any reading activity, bearing in mind that the ultimate goal is the acquisition of meaning. The writer recognizes that there are two main types of inferencing, namely logical and pragmatic. The former may be described as a derivation of conclusions from given information or premises by any acceptable form of

reasoning, either by deduction or induction. The information needed to make the inference is contained largely in the text as in the case of a mathematical equation. A pragmatic inference is a product of the interaction of a reader's background knowledge as triggered by the textual information. It may be described as the "instantiation" of knowledge or the "filling in of the gaps" based on a reader's knowledge schema. The logical inference can be proven whereas the pragmatic inference can only be reasoned. It is the pragmatic inference which is most representative of the reading act, and thus was the subject of this study.

Inferencing as a process is believed to be inherent in every reading activity. It is the interaction of information presented in the text assimilated into the reader's extant knowledge structure permitting the reconstruction of information and may occur at different levels of complexity. Consider a simple sentence such as "The car is red." A reader must first understand what a car is and also have some association of meaning for the colour word "red." In addition, the sentence (text) evokes certain images within the reader and past experiences may be activated, the distinctive features of a car rather than any other type of vehicle are selected and a specific colour is identified. In the example presented, a reader is relating background knowledge to the text in an attempt to derive its meaning. This interaction of background knowledge and text can be further demonstrated by a more complex example. Consider "A warm gentle breeze animated the flowers in the garden." For each reader it evokes certain images, past experiences and memories, and it may have special

significance for some readers but not for others. In response to a question "What season of the year is it?" the answer one would receive would certainly be dependent upon the reader's background knowledge and consequently depend upon what part of the world the reader lived. The inference then is a reflection of the reader's integration of the text information with his own background knowledge. Coherence and continuity in the text are often a function of inferences, in that it is the inference process which provides the integration of the text and background knowledge.

Thus based on the acceptance that an inference results from the interaction of information one already knows with that presented in a text, the problems identified for establishing a theoretical framework were as follows: How does a reader make inferences? How is the reader to get the information in his head and that presented in the text together? Are other cognitive processes involved? How does the reader know what information to use? What strategies does the reader use to generate inferences? However, an analysis of the literature showed that no formal coherent theory of inference existed. This lack of a theory had restricted further research on comprehension by Kintsch and Van Dijk (1978). They declared "a general theory of inference processes is nowhere in sight." Warren, Nicholas and Trabasso (1979) in the following year stated "Little is yet known about inference procedures and how they operate, and no adequate methods exist for assessing what inferences are made during reading." In an attempt to respond to this identified shortcoming it was considered necessary to develop a Theory of

Inference prior to the identification of specific inference strategies used by grade six readers.

Purpose of the Study

The purpose of the study was twofold. First it was necessary to propose a theory of inference which would provide for an improved understanding in the field of reading and to provide direction for the present study. Secondly, the study sought to investigate the abilities of two groups of readers (those very proficient in reading ability and those less proficient in reading ability) to utilize specific inference strategies. The degree to which these readers (subgrouped) were familiar or unfamiliar with the passage content was investigated. In addition, the study sought to elucidate the effect of other possible intervening factors such as the source, the location and the elaboration of the inferences generated, by the two groups of readers.

Definition of Terms

The definitions considered pertinent to the study are given below:

Reading Comprehension - A complex of processes (Geyer and Kolers, 1974) involved in bringing meaning to the printed page (Cleland, 1965) interacting with that written message in order to communicate with the author (Kingston, 1961).

Inference - Information previously unstated explicitly by the author which is generated by the reader on the basis of and within the constraints of the author's textually presented information (McLeod, 1978).

Inference Strategies - The procedures which enable readers to take what is stated in a text, relate their background knowledge to it, and derive its meaning.

Written Discourse - The graphic representation of English verbal language (Robertson, 1966; Cosens, 1974) presented in printed strings of interconnected sentences (Carroll and Freedle, 1972) in a goal-structured format (Mandler and Johnson, 1977) comprising a story of approximately 100 words.

Less Proficient Reader - A subject who has attained a vocabulary and a comprehension score below the fiftieth percentile on the Canadian Test of Basic Skills (King et al., 1977).

Very Proficient Reader - A subject who has attained a vocabulary and a comprehension score above the eighty-fifth percentile on the Canadian Test of Basic Skills (King et al., 1977).

Background Knowledge Plus (Familiar) - Knowledge that is shared by people having lived in a particular cultural tradition. In this study, passages which were relevant to an Alberta background were considered to be background knowledge plus (familiar) for the Alberta students.

Background Knowledge Minus (Unfamiliar) - Knowledge that is shared by

people having lived in a particular cultural tradition that is different from people living in a different cultural tradition. In this study, passages which were relevant to a Newfoundland background were considered to be background knowledge minus (unfamiliar) for Alberta students.

Inferencing Strategies* - For the purposes of the study, ten inferencing strategies were identified as follows: (1) rebinding, (2) questioning a direct or indirect conflict, (3) near or distant shift of focus, (4) case analysis, (5) alternate case assignment, (6) confirming an immediate prior interpretation, (7) confirming a non-immediate prior interpretation, (8) default assumption and information transformation, (9) no response and information holding, and (10) empathy from experience. These are defined in Chapter IV.

Number of Inference Strategies* - In the process of making inferences, subjects may use none, one or more of the ten strategies identified. The number of times each strategy was used was the subject's score for that particular strategy. The total number of inference strategies is the summation of scores across each of the ten strategies.

Source of Inference* - Refers to the kind of information the subject used in making a particular inference. The source may be of two types: (1) extralinguistic when the subject relies mainly on his background knowledge, and (2) linguistic, when both text and background knowledge are used. In the second type, background knowledge is

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*The manner in which these have been determined for statistical analyses is outlined in Chapter IV.

either equal to or less than the amount of text used.

In order to determine the number of instances of each source, the subject's reasons for making the inference were analysed in terms of the key concepts. Key concepts comprised nouns, verbs, adjectives and adverbs, and sometimes prepositions, if they designated place which was important in arriving at the inference. When more of these concepts came from beyond the text the source was identified as extra-linguistic otherwise, the source was linguistic.

Inference Elaboration*- Refers to the degree to which a subject expanded on a particular inference. The amount of elaboration was defined in terms of the number of key concepts used in the subject's reasoning. Since each elaboration was made up of information from both linguistic and extralinguistic sources, the amount from each of these sources was also specified and was referred to as elaboration source data.

Main Inference - Refers to the overall inference in each passage as suggested by the first goal structure and towards which information was presented in all subsequent goal structures. This main inference was believed to provide a focus to the students reading each passage.

Location of the Inference* - Refers to the point at which the subject made the main inference. Location was defined in terms of the place in the text where the inference was made (Early or Late). Early referred to making the inference after goal structures one or two.

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*The manner in which these have been determined for statistical analyses is outlined in Chapter IV.

Late referred to making the inference after goal structure three or subsequent goal structures.

Goal Structure - Is a part of a story in which a particular goal or objective of the story characters is specified. Within each story there were five goal structures. For example in the Rodeo story, the goal structures were: he wanted to go to the rodeo; he wanted the weather to be good for taking pictures; he wanted his dad to stop for Billy's glasses to get a close-up view of the riders; he wanted to buy some pop and hot dogs; and he wanted the rodeo celebrations to start. These are followed by the resolution or goal accomplishment when he enjoys the rodeo.

Research Questions and Hypotheses

The following research questions guided this study and are immediately followed by the corresponding null hypotheses:

Research Question 1a. Will background knowledge as determined by a subject's familiarity or unfamiliarity with the content of a passage be a factor in determining the total number of inference strategies used?

Hypothesis 1a. That background knowledge will not be a factor in determining the total number of inference strategies used.

Research Question 1b. Will the level of reading proficiency be a factor in determining the total number of inference strategies used?

Hypothesis 1b. That reading proficiency will not be a factor in

determining the total number of inference strategies used.

Research Question 2. Will there be interaction effects between background knowledge and reading proficiency as predictors of the total number of inference strategies used?

Hypothesis 2. That there will be no interaction effects between background knowledge and reading proficiency as predictors of the total number of inference strategies used.

Research Question 3a. Will background knowledge as determined by a subject's familiarity or unfamiliarity with the content of a passage be a factor in determining the nature of each of the inference strategies (N = 10) used?

Hypothesis 3a. That background knowledge will not be a factor in determining the nature of each of the inference strategies (N = 10) used.

Research Question 3b. Will the level of reading proficiency be a factor in determining the nature of each of the inference strategies (N = 10) used?

Hypothesis 3b. That reading proficiency will not be a factor in determining the nature of each of the inference strategies (N = 10) used.

Research Question 4. Will there be interaction effects between background knowledge and reading proficiency as predictors of the nature of inference strategies (N = 10) used?

Hypothesis 4. That there will be no interaction effects between background knowledge and reading proficiency as predictors of the nature of the inference strategies (N = 10) used.

Research Question 5a. Will background knowledge and reading proficiency be factors determining the extent to which the proportion of the information source is extralinguistic in the generation of inferences?

Hypothesis 5a. That background knowledge and reading proficiency will not be factors determining the extent to which the proportion of the information source is extralinguistic in the generation of inferences.

Research Question 5b. Will background knowledge and reading proficiency be factors determining the extent to which the proportion of the inference elaborations are extralinguistic?

Hypothesis 5b. That background knowledge and reading proficiency will not be factors determining the extent to which the proportion of the inference elaborations are extralinguistic.

Research Question 6a. Will background knowledge and reader proficiency be factors determining the location of the main inference (Early or Late)?

Hypothesis 6a. That background knowledge and reader proficiency will not be factors determining the location of the main inference (Early or Late).

Research Question 6b. Will there be interaction effects between background knowledge and reading proficiency in determining the location of the main inference (Early or Late)?

Hypothesis 6b. That there will be no interaction effects between background knowledge and reading proficiency in determining the location of the main inference (Early or Late).

Research Question 7a. Will background knowledge and reading proficiency (when strategies 04, 06, 09 and 10 are the covariates) be factors determining the extent to which the proportion of the subject's information source for inferencing is extralinguistic?

Hypothesis 7a. That background knowledge and reading proficiency (when strategies 04, 06, 09 and 10 are the covariates) will not be factors determining the extent to which the proportion of the subject's information source for inferencing is extralinguistic.

Research Question 7b. Will background knowledge and reading proficiency (when strategies 09 and 10 are the covariates) be factors determining the location of the main inference (Early or Late)?

Hypothesis 7b. That background knowledge and reading proficiency (when strategies 09 and 10 are the covariates) will not be factors determining the location of the main inference (Early or Late).

Research Question 8. Will background knowledge and reading proficiency (when strategies 09, 10 and the proportion of extralinguistic information are covariates) be factors in determining

the location of the main inference (Early or Late)?

Hypothesis 8. That background knowledge and reading proficiency (when strategies 09, 10 and the proportion of extralinguistic information are covariates) will not be factors in determining the location of the main inference (Early or Late).

Significance of the Study

This study was part theoretical and part experimental in nature. Much research has been done concerning inference, however, all has been done without a viable theory. The theory proposed in the present study should in a small measure expand understanding and practice with respect to inference as an aspect of reading, and provide a conceptual framework from which to study what is presently known as well as to direct future research.

The experimental part of the study was concerned with the identification of the inference strategies used by upper elementary readers. The more extensively this process of reading is understood then the more advances which can be made in terms of instructional materials and teaching practices.

Limitations of the Study

The researcher acknowledges the following limitations in connection with the study.

1. Undoubtedly there were factors other than those considered in the study which influence the inference process but which were beyond the scope of the study. Whilst a good deal is known about

inferencing, conceivably there could be other factors yet to be considered by theoreticians which affect inferencing.

2. The sample was reduced to a manageable size as the actual recording and coding of the data was extremely time consuming.

3. The elimination of average readers limits the generalization of the findings.

4. The subjects who composed the sample were drawn from one grade level only, grade six, and thus findings may only be generalized to this group.

5. Since the theory in the study was the first known formal model, it cannot be tested against previous models.

6. The methodology applied in terms of identifying the nature of the inference strategies being used by the subjects necessitated a type of interrupted reading possibly uncommon in reading instruction. This interrupted technique was agreed upon after much thought and discussion and was deemed to be the most effective in terms of the information being sought. In order to make it as comparable as possible to a classroom instruction situation, the subjects were allowed to read each episode before being asked to introspect or be questioned.

Assumptions of the Study

The researcher was guided by the following assumptions in planning, conducting, and interpreting the research data.

1. Children are expected to make inferences in all reading situations where the acquisition of meaning is the ultimate goal.

2. The kind of strategies identified in the study are similar to those which the subjects would use if they were to read on their own.

3. Three passages identified as background plus (familiar) were based on Albertan experiences and it was assumed that the subjects would be familiar with these experiences and would not be familiar with the Newfoundland experiences on which the remaining passages were based (background minus).

Overview of the Investigation

The chapter which follows provides a setting based on other research on inference for the purpose of developing a theoretical framework. It also provides a background for the investigation of the inference strategies. Chapter III presents the actual development of a Theory of Inference in reading comprehension. The derivation of the six components of the theory are discussed as well as their interactive nature in the reading act. Following this, the design of the study is presented in Chapter IV. In the following chapter, Chapter V, the findings of those hypotheses dealing specifically with the identified inference strategies are presented. Chapter VI presents the findings on the variables affecting the inference strategies. The final chapter, Chapter VII, presents the conclusions drawn from the two previous chapters and discusses them in the light of the theoretical perspective of the study. Implications for further research and implications for classroom practice are also discussed.

Chapter II

REVIEW OF RELATED LITERATURE

Introduction

The purpose of this review of the literature is first to provide the background in the light of other research for the inferencing process. A second purpose is to develop a perspective within which to study the inferencing process by considering the heritage of past research. Finally, by collating the findings and applications of scholars working in the domain of inferencing, one establishes a data base for the development of a Theory of Inference.

The following sections discuss five areas regarding inference which seem to be identifiable in the literature from the perspective of the researcher: (1) inference as a skill, (2) inference as a process, (3) inference as an integrating agent, (4) inference as a memory aid, and (5) inference as a developmental behaviour. These areas highlight facets of the significant role of inference in reading comprehension. The five areas as identified for this review are for purposes of clarity. These divisions are not intended to suggest distinct entities functioning within the reader nor to suggest each as being a disjointed function.

Inference as a Skill

Researchers in the first three quarters of the twentieth century generally attempted to delineate the reading skills required of students in instructional materials. In addition, they set up a type of hierarchy of skills such that particular skills were to be taught at particular times. This section presents an overview of inference considered within a skill domain.

The National Society for the Study of Education in 1919 listed eight skills of comprehension as proposed by W. S. Gray, one of which was inference. In 1949, Johnson in a discussion of the factors of reading comprehension stated "comprehension is a result of many component skills and abilities" (p. 386).

Expansion of Gray's earlier model by Robinson in 1966 saw inference as understanding the implied meaning of a writer, as well as the integration of information and ideas of a writer with the reader's information and related experiences.

A construct or model attempting to elucidate the intellectual processes employed by a reader was proposed by Cleland (1965). In comprehension, he delineated six factors: perception, apperception, abstraction, appraisal, ideation, and application. Apperception, the second factor closely relates to what other authors call inferential reading.

Eight skills of comprehension, including skills dealing with literal or explicitly stated comprehension and skills calling for inferential comprehension, were measured in a study by Davis (1968). This study showed "that part of the variance of these eight

comprehension skills is unique; therefore, teaching one of them cannot be counted on to cause improvement in others" (p. 543). Thus, research gives evidence of the uniqueness of particular reading comprehension skills but no evidence of tests actually measuring these specific skills.

A taxonomy of comprehension skills was presented by Ruddell in 1972. He divided this taxonomy into two components: (1) Experience and Memory, and (2) Critical Thinking. Within Critical Thinking, he listed integrative skills which entail summarizing information. Consequently to summarize information a reader had to be able to infer facts and ideas not explicitly stated in the text.

Smith (1972), having suggested that reading research has neglected comprehension, proposed four comprehension skills which teachers should endeavor to teach. These are literal comprehension, interpretation, critical reading, and creative reading. She defines interpretation as providing meanings which are not explicitly stated in the text.

Pettit and Cockriel (1974) cite that there appears to be agreement among researchers (Singer, 1965; Fagan, 1971; Simon, 1971; and Davis, 1972) that there is indeed, some hierarchy of reading comprehension skills. Research by Pettit and Cockriel using a sample of 533 sixth-grade students tested specific skills within the categories of literal and inferential comprehension. Two tests designed by Pettit in 1970 were used to test these specific skills: the Literal Reading Comprehension Test (LRC) composed of six specific skills, and the Inferential Reading Comprehension Test (IRC) composed

of five specific skills. Student responses resulted in intercorrelations from .40 to .58 on the eleven subskills. These results tend to confirm the general opinion of other educators that a hierarchy of reading comprehension skills may exist and that all reading skills tend to be correlated. It seems logical to assume that a reader must obtain the literal meaning of a reading selection before he can understand implied meanings within the same passage.

Four comprehension skills: Literal Recognition or Recall, Inference, Evaluation, and Apperception were presented in a taxonomy of reading comprehension developed in 1974 by Smith and Barrett. When a reader "uses a synthesis of literal content of a selection, his personal knowledge, his intuition and his imagination as basis for conjecture and hypothesis . . ." (p. 64), then they indicate that inferential comprehension takes place.

In summary, it appears that there is a consensus among researchers that inferencing is a crucial skill in reading comprehension. Researchers, having seemingly categorized inference collectively with all the possible reading skills, began to sense the need to study the acquisition of these skills. This shift from the study of inference as a product to inferencing as a process is the subject of the next section to be reviewed.

Inference as a Comprehension Process

Comprehension is an elaborate process with a constructive nature depending on both intra-sentence and extra-sentence context. Inference as a process then is in a sense an extension or continuation

of this original input. The input (text) becomes the triggering mechanism which activates the reader to retrieve relevant background knowledge and the reader meaningfully combines it with the information presented in the text.

Sixty-three years ago, Thorndike viewed reading within a problem-solving structure and observed that reading was "a very elaborate procedure, involving a weighing of each of many elements in a sentence, their organization in the proper relation to one another, the selection of certain of their connotations and rejection of others, and the cooperation of many forces to determine final response" (1917: 323). Weighing, selecting, and organizing were three processes identified by Thorndike to be necessary to inferencing. The first two of these processes were later identified by others to be essential to the drawing of inferences (Swain, 1953; Piekarz, 1954; Jenkinson, 1957; and Letton, 1958).

In order to model the process of making inferences, the reader may be placed at a moving point in an unfolding narrative. This point is termed the focal point (event) in an event chain (Nicholas, 1976; Trabasso and Nicholas, 1977). The inferences made from this point may be directed backward, linking it with previous events in the chain similar to Clark's (1975) concept of bridging, or forward predicting of subsequent events. Warren et al. (1979:24) discuss these forward and backward directed processes as the reader interrogating the text on the basis of the information he has in his possession at the time, asking Who? What? When? Where? Why? or How? in order to justify the focal event in relation to previous

events, and What Next? in order to anticipate the coming events. Schank (1975:238) suggested that the information processes required at least two functional abilities regarding the drawing of inferences. These were (1) "how to use context to direct inferencing," and (2) "when to stop making inferences." When information is not supplied to set the stage for the following sentence, the receiver of the message must supply the needed information framework in order to establish coherence with what has gone before. Schank differentiates the two types of inference: (1) Backward-looking inferences (required to establish the framework for each input conceptualization for which the necessary conditions have not been explicitly provided), and (2) Forward-looking inferences (a state that is inferrable from established conditions based on input conceptualization). Whether one has to make a backward-looking or forward-looking inference would seem to be dependent upon one's background knowledge.

Clark (1975) distinguished between authorized inferences (those intended by the author) and unauthorized inferences (those which are not intended). Goetz (1977:32) argues that the reader cannot draw all possible inferences, therefore the reader will select the important elements for inferential elaboration, or put another way, the reader will be more likely to make an inference if it is important at the point of comprehension.

The influence of prior knowledge on comprehension and investigations as to the hierarchical relationship between explicit and implicit questions was the subject of a study by Gordon et al. (1979). This study was unique in that second grade children were the subjects

used in an effort to ascertain the relative influence of scripts (situation-specific knowledge) on reading comprehension at primary grade levels. The twenty children were of equal reading ability but were grouped on the basis of previous background knowledge about the topic (spiders). The students were then divided into two groups (high or low). A basal reader selection on spiders was chosen at the students' readability level and a list of twelve posttest questions was prepared. The students read the actual basal selection and were then presented the twelve posttest questions orally. The findings of this study support the contention that the background experiences readers bring to a selection affect the depth to which they can understand it—this effect was found to be comparable for both explicit and implicit questions. In terms of schema theory, the findings support the notion that comprehension is a process of integrating novel information into pre-existing schemata.

Contrary to typical research findings that information including inferences are processed at the time of input (Anderson and Bower, 1973; Frederiksen, 1975; Kintsch, 1974; and Meyer, 1975) whether or not they are explicitly expressed, Spiro and Esposito (1977) propose an alternative hypothesis that there is really only a "superficial processing of presented inferences (SPPI)" at the point of input. Two experiments were designed to test this hypothesis. Twenty undergraduates randomly assigned to groups of four or less were presented with a twenty-four page booklet "What became of the Old Classmates?" which featured eleven character vignettes of approximately 250 words each. Eight vignettes were the actual target information for the

study, whilst the remaining three were unanalyzed and served only as buffers at the beginning and end of the book. An introductory page stated that the vignettes would describe events involving several old classmates who had gone their separate ways and were now being observed several years after graduation. Each vignette was composed of information A and B such that B was implied by A, and information C, which lessened the extent to which B was implied by A. The experiment entailed three conditions: (1) C after A and B, (2) C before A and B, and (3) no C.

The students were instructed to read a story and were then asked questions related to the story to which they were to write their answers. They were also told that their first reactions were most important and that they must not change them when other information was introduced. The results of this experiment supported the hypothesis that pragmatic inferences implied in the text are superficially processed and do not receive a stable and enduring representation in memory (12). The finding it seems may not be totally disparate in terms of the work of Kintsch et al. as suggested by Spiro and Esposito, since they did not consider the degree to which the inference is important to the text as did Kintsch and others.

In order to determine whether readers were actually processing inferences at the time of comprehending and then changing that inference in the light of subsequent contradictory information, the authors conducted a second study. In the second experiment utilizing the same students as in experiment one, questions were either interspersed (immediately after reading each story) or given after the

entire set of stories had been read (Questions—after conditions). The results of experiment two replicated those of experiment one and additionally demonstrated that the C after effect is not due to changing a stored representation of the B information (the implied inference). It seems that a lot of what is read is predictable, therefore the reader processes information only superficially and later at the time of recall uses other text information to retrieve a schema of information from which the inference is easily predicted.

In summary, an ability to infer appears from the research findings to be one of the processes required for comprehension. It seems that readers can and do generate inferences in order to reconstruct and retain an author's message. A reader in an inference situation integrates the information in the text with his own background knowledge. This integration is the subject of the next section.

Inference as an Integrating Agent

Readers tend to combine isolated units into more integrated units in memory, with the resulting integrated ideas being somewhat modified. Another way of stating this notion of integration would be that the total is more than the sum of the parts.

The work of Bransford, Barclay and Franks (1972) investigated the adequacy of an interpretive linguistic approach to the description of the knowledge communicated by sentences. In three successive experiments using eighteen, seventeen and forty-five undergraduates respectively, they asked whether sentence retention was primarily a

function of memory for the semantically interpreted deep structural relations underlying the input sentences or a function of memory for the overall semantic situations that such sentences described. Congruent results supporting a constructive theory were revealed in all three experiments: "Recognition was shown to be primarily a function of the complete semantic descriptions constructed rather than a function of just that information specified by the linguistic input string" (1972:205).

In describing reading as a psycholinguistic guessing game, Goodman (1973) emphasizes the impact of the reader's experiences and expectations, and the role of contextual and nonprint cues in the situation. A great deal of Goodman's research has investigated the oral reading miscues that students make as they read aloud. These errors usually reflect the reader's attempt to give a meaningful version of the text rather than random errors. In other words, word meaning is more than reference (the specification of the meaning of words in terms of the objects or events they are concerned with). Ortony (1973) maintains that the choice of words in a sentence is more a function of the speaker's knowledge and the environmental context than it is a function of syntactic or semantic restrictions. On the other hand, Katz and Fodor (1963) maintain that from the reader's or listener's point of view, the meaning attributed to a sentence is more a product of the specific words used. These researchers believed then, that reading is more of a cognitive process rather than a linguistic one.

Research into story grammars (Bower, 1976; Stein and Glenn,

1978) has shown that subjects are better able to verify and recall statements which are central to the story structure. Thus, it is believed that coherence is a characteristic feature of the comprehension processes. Bower, in an extension of Bartlett's work discussed under memory, showed that texts differ in both their comprehensibility and in their memorability. Using thirty-two college students in four different groups, one group was to read the "Old Farmer" narrative in normal story form, the second group was to read it with the theme at the end, the third group was to read it with no theme, and the fourth group read a totally random arrangement of the original story. These students were to rate their text on a ten point scale for its comprehensibility, without any idea that they would later be expected to recall it. The narratives were read within ninety seconds, at which point the subjects engaged in an unrelated learning task for forty minutes, after which they were asked to recall the Farmer passage. As expected, the more tightly knit the goal structure of the text, the more coherent and comprehensible it was judged to be and the better it was recalled. Bower posited three factors as to why a coherent story is better remembered than a series of unrelated events: (1) it fits the reader's story frame and his predictions about events are being consistently confirmed, (2) the restrictive set of retrieval cues in the unrelated frame prevent the reader from generating recall on the components and episodes, and (3) the coherent story is more redundant or interconnected in terms of the text components. The conclusion by Bower is "that people reorganize a narrative according to a theme given to them, and that their telling of the reorganized

narrative moves the top goal into its normal initial position" (p. 518).

In three follow up studies with Thorndyke (1975), Bower (1976) found that there is a hierarchy of propositions in a story such that those elements at the higher levels proved to be the more likely to be remembered and consequently included in a summary since details are usually forgotten over time. It was also found that recall varies according to the concreteness of the characters, their actions, and also according to the coherence of the plot. Transfer learning effects were examined across successive passages in that subjects seemed to be learning the general framework for similar texts involving similar characters at the same time as they were becoming increasingly confused about the precise details of a particular story.

Of prime concern to this review was Bower's experiment on the role of inferences in understanding text. Subjects studied four different passages of twenty sentences each, with each passage containing two critical "Event A" sentences (The teacher swung her hand at little Mary who was misbehaving). Different subjects read stories that were identical except for a B statement (Mary noticed that her lip was bleeding) or the neutral C statement (Mary heard some birds singing outside the classroom window). One group rated the plausibility of various inferences whereas the other group performed a recognition memory test. Subjects in the latter group confused in memory what was said explicitly with inferences which were plausible. The likelihood of identifying an inference as having been in the text increased with its plausibility. It appears that only

those central inferences used in bridging between salient events of the text are kept in memory which is believed to occur at the time the text is read.

Warren et al. (1979) state that the interposition of semantically incongruous events between logically connected events may lead to inferences that were unintended by the writer or speaker. Such a disruption occurs at a very local level, essentially between adjacent pairs of events, and underlines the loss in comprehension and recall as indicated in a number of recent studies on story grammars. Kintsch and Koziminsky (1977), Mandler (1977), Thorndyke (1977), Stein (1978), and Stein and Glenn (1978) have all shown that disordering of sentences in a text leads to lower levels of recall. Such findings are taken to support a particular grammar and the idea that understanders possess prior "schemas" for assimilating story information.

Johnson et al. (1973) reported that slight changes in inputs can result in large differences in the ideas communicated, including the implication that may be derived. A "coherence formulation of instantiation" was discussed by Anderson and Ortony (1975). This notion suggests that a person often must make assumptions about particulars that go beyond that which is given in a message in order to construct a consistently and satisfying overall interpretation. The instantiated cases will be the ones required for the representation as a whole to make sense.

"Comprehension involves relating the words and clauses in an individual sentence to other information, often information in the previous part of the discourse or information encoded from the

perceptual context" (Carpenter and Just, 1975:239). This integrative process involves a search through the active memory to relate the new information to the old (that which has been previously processed). This search is activated by the current topic and is faster when the currently processed sentence is directly related to the topic. This search can go beyond the actual discourse to other information active in one's memory at that time. It is reported that the duration of the search increases as the reader searches through more information in memory. This search is partially directed by various linguistic devices such as clause structure, question-answer sequences, definite and indefinite articles, and key-word repetitions. Thus, it is clear that integrative processes play a primary role in language comprehension.

In summary, readers depend upon a broad range of world knowledge which they spontaneously integrate with the text to draw conclusions and to form inferences. The next section will treat inference as a memory aid since original material presented may not endure.

Inference as a Memory Aid

A classic demonstration of the fact that memory for original material does not endure may be traced back to the work of Bartlett in 1932. It seems that once individual language segments are integrated and fused into events, subjects cannot recover the original

pattern which had provided support for the construction. Bartlett suggested that people develop schemata of what stories are like and he used this notion to account for some of the reconstructive aspects of recall. He demonstrated this by presenting subjects with a passage and having them free recall it at various intervals over time. Omissions, distortions, and other changes in memory were accounted for on the grounds that people use a story schema as a set of retrieval cues, such that when a particular aspect cannot be recalled they will utilize their schema to reconstruct what might have occurred at that point.

Pursuing the work of Bartlett, Mandler (1977) contended that information is stored in memory in an organized fashion. Although the schemata used to encode a story and to retrieve it were believed related, they were not assumed to be identical. However, Tulving and Thompson (1973) found that although the form in which information is processed influences the form in which it is retrieved, neither the amount encoded nor even the level at which incoming information is processed is sufficient to predict recall of discourse (Craik and Lockhart, 1972).

An associated network approach to memory was studied by Rumelhart, Lindsay and Norman in 1972. Altering the context of individual words can be shown to affect the meaning attributed to the words. This was demonstrated in studies where words were provided context by the sentences in which they were embedded. Anderson and Ortony (1975) presented subjects with a series of sentences which were followed by cues for recall which were either effective or

ineffective for the retrieval of the sentence, dependent upon the perceived mental representation of the original sentence. Half of the subjects saw the sentence "The container held the cola," the other half saw "The container held the apples." The words "basket" and "bottle" were the corresponding cues, however, "bottle" would be a better cue for the first sentence and "basket" for the second, even though the topic "container" was mentioned in both sentences. A significant effect of type of cue was reported in this study, in the direction predicted by the context-dependence hypothesis. "Cues close to the meaning of the original sentences were more effective than remote cues" (p. 170). It appears that the mental representation of sentences is not simply the lexical readings of the individual words but the categorization of these into a more abstract framework.

The tendency to use the information expressed in single sentences to form wholistic mental representations which go beyond meaning expressed in the single sentences was supported in a study by Barclay (1973). Similarly constructed sentences which randomly described a linear array of five animals (one pair in each sentence) were presented to subjects, for example, "The bear is to the left of the mouse." Half of the subjects were told that their task was to figure out the order of the animals while the other half not informed of this general structure, attempted to memorize the sentences. An unexpected recognition test was given to the subjects five minutes after they heard the acquisition set of eleven sentences. These recognized sentences consisted of true or false sentences with only the true sentences having been presented in the original list. The

subjects given the structured task rated all of the true sentences as "old" and all of the false sentences as "new" irrespective of whether they had been previously presented or not. The uninformed subjects were consistently lower than the informed subjects in their recognition judgments. They seemed to depend more on learning sentences similar to the acquisition sentences, than on their "truth value." It appears that this study illustrates both the process of integration in memory and also subjects' ability to make inferences which go beyond the information presented.

There is evidence to suggest that the instructions and task given affect performance. The effect of varying instructions on comprehension has been studied by Frederiksen (1972, 1975) and Spiro (1975). Frederiksen found that subjects who received the problem solving plus memory test instructions produced more inferences than subjects who received the memory test instructions. Spiro told subjects either that they were in a memory experiment or that they were in an experiment concerning reactions to interpersonal relations. Subjects then read a story about an engaged couple, part of which discussed the feelings of each person regarding children. Subjects who thought they were in the interpersonal relations experiment were more likely to engage their knowledge of interpersonal relationships than were subjects who were trying to memorize a passage for a memory experiment.

In summary, it appears that readers remember text by integrating information in the most semantically acceptable manner. This is influenced by text cues, recall cues including task directions,

and by the cognitive framework constructed at the time of information input.

The studies cited thus far have dealt primarily with the nature of inferencing. The final section of this review will concentrate on the developmental aspects of inferencing.

Inference as a Developmental Behavior

There appears to be a developmental aspect to the comprehension processes. In reference to the specific process of inferencing, there seems to be some disparity in this area. Piaget (1957) and Inhelder and Piaget (1958) maintain that children under eleven to twelve years given propositions 1a and 1b have difficulty inferring 1:

1a. Edith is lighter than Suzanne.
1b. Edith is darker than Lucy.
1. Lucy is lighter than Suzanne.

It must be pointed out, however, that this is a type of logical inference which may necessitate different capabilities as suggested by Goetz:

> While logical inferences are important, the cases sanctioned by logic or mathematics do not exhaust the types of inference involved in natural language comprehension. Formal systems involve an idealized, tidy notion of inference which is unsuited for use as a psychological model. The inferential processes of humans are simply not limited to, nor are they always guided by, those forms of inference presented in logic and mathematics. (1977:8)

The pragmatic inference which is the focus of this study is a product of the interaction of a reader's background knowledge stimulated by the textual information.

The comprehension of related sentences from which inferences could be produced was investigated by Blachowicz (1978). This study

which utilized forty school children from grades two, five and seven and thirty graduate students, requested each subject to read ten paragraphs made up of three sentences with lexical items representative of second-grade reading materials. Subjects then took part in a three-minute interpolated task without the paragraphs. They were required to indicate "yes" or "no" as to whether they had seen a list of sentences before which were distinct from the originally presented paragraphs. These sentences were comprised of true inferences, false inferences, true statements and false statements. A significant difference was found in the bulk of errors, with grade two pupils identifying more inferred recognized sentences as originals, whilst the adults made fewer misrecognitions. All the age groups indicated a similarity in their patterns of errors such that there was "recognition" of a greater number of true inferences than false inferences, true statements or false statements. The overall conclusion by Blachowicz stated that subjects tended to "recognize" semantically similar inferences as originally explicitly stated textual material.

Bransford and Franks (1971) also concluded that adult subjects "integrated the information communicated by the sets of individual sentences to construct wholistic semantic ideas" (p. 348). Using oral language input they analyzed complex sentences into simple sentences. Using fifteen, sixteen and fifty undergraduates respectively in three similar studies, they explored aspects of meaning, memory, and inference. The complete complex sentence was never presented as a unit; however, all the semantic aspects were used in

the simple sentence presentations. Having been presented with the simple sentence orally, the subjects were then given a list which was made up of simple sentences, simple combinations and complex sentences. It was found that the subjects usually indicated with a high degree of confidence that the complex sentence represented what they heard. These complex sentences required making inferred relationships.

Paris (1977) states that between the ages of six and twelve years, children significantly alter their propensity or ability to apply inferential processes to tasks of sentence memory. The functional utility of indirect and implied retrieval cues increases with age. These findings corroborate earlier research of children's memory for stories which suggested that constructive encoding operations improved with age and became increasingly related to recall.

Harris (1974) found that children from four to twelve years of age similarly made considerable use of inferences in even the comprehension of "Nonfactive" material (sentences that contained a degree of uncertainty—think, be sure). Similarly, Tulving (1972) found no age differences in ability to derive inferences. Children in Kindergarten were just as liable to make inferences under each of the encoding conditions as were adolescents in Grade Nine, however, input format was not a consideration in that study.

Two experiments were conducted by Thorndyke (1975) to examine how adult readers use inferences to aid comprehension of connected discourse. In the first experiment, four unrelated narrative discourses with a mean length of twenty sentences were used. Each passage contained two "target-continuation" pairs of sentences

embedded in the text. No inference was required to link the target and continuation sentences which were identified by a slash for the control group. Each of the twenty-four undergraduates equally divided into a control and an experimental group were to read up to the slash and then write down a minimum of three inferences that could be gleaned at that point, based on the previously provided text information. This procedure was continued until all the stories were completed. Each subject was then required to use a seven point scale to rate the plausibility of the text passages in terms of a list of inferences. Thorndyke concluded "the results of experiment one confirmed the expectations about the salience (i.e. production frequency) and plausibility of the preselected experimental inferences" (p. 442). This conclusion led to experiment two which was designed to test that when the inferences generated during comprehension are stored in memory they are stored with the text information to which they relate. Each of forty-eight undergraduates divided into a control and an experimental group were asked to read four passages and to rate each in terms of meaningfulness, comprehensibility, and imagery. Each subject then completed a memory test where they had to identify each sentence as either directly stated in the stories or as an inference, as the experimenter read a set of twelve sentences. From the findings, Thorndyke concluded that "the sentence is stored in an integrated structure with its associated inferences" (p. 444).

An extension of the above cited research from adults to children was carried out by McLeod in 1978. Using forty grade four subjects classified equally as Very Proficient readers or Less

Proficient readers, he investigated the role of inferences in discourse reading comprehension. Specifically, the main facets of the study were to explore the generation of forward-looking and backward-looking inferences, as well as to examine whether inference generation is related to simultaneous and successive cognitive synthesis. Each child completed three reading-related inference tasks in individual introspective-retrospective interview sessions. The major conclusions resulting from McLeod's study are:

> Grade four students are required to generate both forward and backward looking inferences in prepared instructional activities which make different cognitive demands on the maturing reader; inference generation is related to cognitive synthesis, however, other cognitive strategies such as selecting appropriate support textual information, and linking the inference back into the story context to confirm that it "makes sense", also significantly differentiated the Less Proficient from the Very Proficient Readers. (p. vi)

The differences in inferencing behavior among average and low readers was the subject of a piece of research completed by Schienbein (1978). He analyzed inferential responses in an attempt to determine developmental and process differences among three reading proficiency groups when they were to comprehend written continuous narrative discourse. Thirty-six students were equally divided into three categories comprised of an average grade four reading group, an average grade six reading group, and a low grade six reading group (equivalent to grade four in reading ability) according to the New Developmental Reading Test, Form A, 1968. Each subject was to silently read a passage and to recall it unaided. Each subject was then asked ten inferential questions based on the passage. The recall task did not discriminate between the average and low readers in terms of

inferencing behaviour nor were significant developmental differences found on the inferential question task. However, a significant developmental difference was indicated for the quantity of backward looking inferences produced but not for forward looking inferences. Schienbein concluded "both average and low readers at the upper elementary level produce, store and recall inferences as an integral part of their memory for written continuous narrative discourse" (p. v).

To understand how readers at two age levels perform differently in their inferencing was the subject of a study by Beach in 1979. He sought to determine the differences between sixty tenth grade high school students' and sixty college freshmen's responses to a one-act play. The play was geared to the readability of the high school students and was divided into three sections of approximately 1,500 words in each. Subjects were individually requested to read silently the first section of the play as many times as they wished, at their own pace. Immediately following the completed reading of the first section, the students were asked to recall the verbal interaction between the two characters in the play. The students were afterwards asked to describe what was happening and to give a reason for why that was happening.

Each recall unit was categorized according to one of seven categories based in the main on a taxonomy proposed by Warren, Nicholas and Trabasso (1979) for analysis of inferences about stories. The findings of this study concluded that both high school and college subjects responded in terms of recall units categorized

as restatement; only reading ability was significantly affected by grade level; and in terms of reasons for selected dialogue acts, subjects varied in the extent to which they explained the act according to characters' long-range goals and beliefs.

Children's ability to produce inferences from verbal material depends upon the degree to which that material can be related to prior knowledge (Hildyard, 1979). Young children are as capable as older children of producing the types of inferences common in everyday language, that is, inferences which draw implicit information about situations, contexts and so on. What younger children cannot do is draw logical implications from arbitrary propositions; they cannot manipulate propositions per se. Young children appear to have to be able to relate the given proposition to their prior expectancies and knowledge in order to comprehend it. Older children and adults, on the other hand, appear to be able to suspend their knowledge of the world when appropriate and operate upon the "sentence meaning" of the propositions and the logical entailments of those propositions. This would relate to Piaget's stages where abstract versus concrete thinking typifies older subjects such that older subjects can think abstractly as well as about concrete things. Such an ability may be a consequence of the level of literacy (Cole and Scribner, 1974; Olson, 1977a; Scribner, 1975).

However, according to Brown (1976) children below the age of six or seven have great difficulty in spontaneously generating the cause of subsequent behaviour or in proceeding in reverse fashion through a logical chain. Therefore, when the first category in an

episode is deleted, young children may have more difficulty adding information to the story than older children.

Applebee (1978) found in his research of children from the ages of two to seventeen that their concept as well as their tactics for dealing with a story varied with their general stages of mental development. The adolescent has the ability to go beyond the information given in the text. The ability to coordinate general information units simultaneously is characteristic of the formal operational stage whereas younger children tend to use an additive procedure consequently restricting the amount of information to be dealt with at any one time.

Although no studies have examined inference developmentally in the true sense of the word, from cross-sectional studies completed at various age levels, it seems that the following statements may be made: (1) inferencing behavior is demonstrated by both children and adults; (2) as might be expected, older subjects can do more of what younger subjects can do; (3) older subjects differ in their inferences in that they have more background knowledge to draw on which would give them an advantage in making more inferences; and (4) finally, the older subject has an advantage in that having reached the stage of formal operational thinking, he can hold information tentatively and weigh more data (both text and prior knowledge) before making an inference.

Summary

This chapter has attempted to present the literature on inference from five perspectives which characterize the thinking and research of experts in the field. However, each perspective tends to be rather isolated in that the manner in which inferencing occurs and the factors affecting inferencing are not interwoven into a connective theoretical framework.

Based on the existing research it seems that inferencing is viewed both as an essential comprehension process and as a skill. From the dates of the research it seems that the notion of inference as a process is replacing the notion of inference as a skill and thus, in the theory that follows, inference will be viewed as a process. As a process, inferencing is dependent upon a reader's background knowledge and type of textual input which will also be considered as theory components. The purposes or task directions and the context in which they are presented appear to influence both the writer and the reader of the text. Based on this literature review, on further writings, and on the researcher's thinking, six components have been abstracted as fundamental to a theory of inference. This theory will be developed in the next chapter.

Chapter III

A THEORY OF INFERENCE IN READING COMPREHENSION

Introduction

Since the purpose of this study was to identify the strategies used by readers in the generation of inferences, it seemed necessary to provide a theoretical position. While the experimental information may have been obtained without a theory, to have done so would have been a perpetuation of the current state of affairs. But once a theory is available, one becomes more aware of the bounds of the domain to which generalizations can be made and of the various relationships (both descriptive and explanatory) which perhaps allows one to explain in what way (degree, manner) one component relates to another. In addition, a theory allows for the consideration of those components which are not being directly tested as well as those that are.

For the theory to be mapped out here, the broader phenomenal domain (the area from which the theory takes its content) is defined as the field of Reading and within reading, the focus is on the cognitive and linguistic processes which occur during the act of reading. These processes have been identified and labelled in various ways by different writers in the field (Smith, 1971; Collins et al., 1977; Henry, 1974).

One of these processes, INFERENCING, was selected for a more thorough investigation in this study. The narrowing down of the

domain may be represented graphically as in Figure 1.

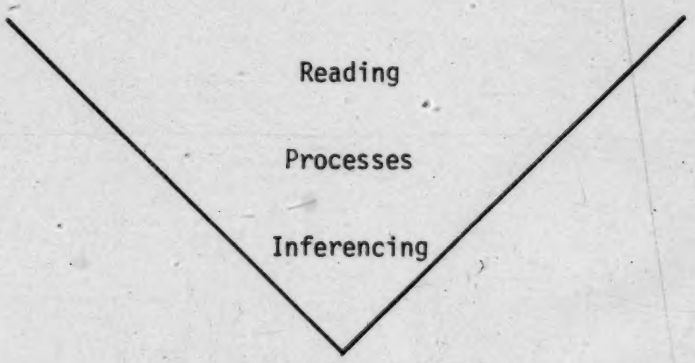

Figure 1

Illustration of P-domain of Reading

Inferencing relates specifically to a cognitive operation which occurs when the READER ENCOUNTERS THE TEXT. Thus to study inference, one must consider additional interacting components within the field of READING.

One must consider factors such as what the reader already knows, his level of reading proficiency, and level of intellectual ability. To have a reader implies that there must be a TEXT, and to have a text must imply a WRITER. The reader, writer and text must "come together" in an ENCOUNTER. Further all three must come together within a particular SITUATION identified to be the READING SITUATION which is part of a broader environment, a component identified as CONTEXT.

In order to elucidate these components, information from the field of reading itself and from related fields of study must be utilized. The theory of inference submitted in this study is based

on the synthesis of the research within the reading, cognitive psychology, sociology and philosophy of language paradigms. The researcher's experience and innumerable discussions with others have also contributed to the development of the theory.

In summary, this theory of inference is based on six components identified as follows: (1) context, (2) reading situation, (3) writer, (4) text, (5) reader, and (6) encounter (for this study, specifically the reader-text encounter). These are presented graphically in Figure 2. Overlap in these components is unavoidable since it is believed that all are interdependent and interactive in nature. A diagram, by nature, is static. In that sense, a diagram can only suggest the presence of specific components within a theory; it cannot (by its arrows and connecting lines, etc.) show the particular relationship of the components, since these relationships will vary depending upon the degree to which one or the other of the components is focussed.

Context

Context is the total environmental setting in which a reader's experiences are embedded. It includes the entire range of external influences both physical and biological, both social and economic factors, both cultural tradition and the reciprocal relations between participants, and their environment. Within any cultural setting, the participants are bound by a series of constitutive and regulative rules (Giboney, 1979). The former specify the components within a particular context. For example, participants within a specific

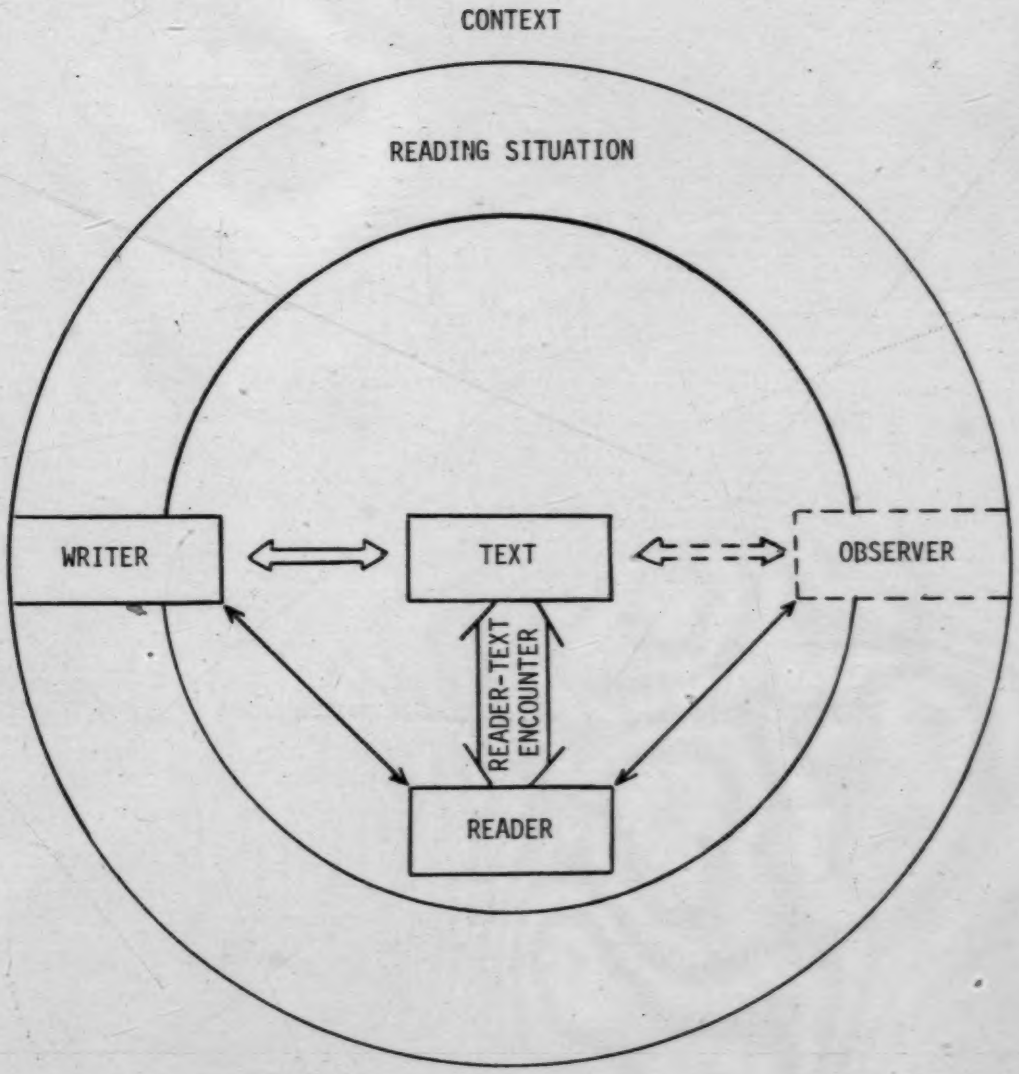

Figure 2

Components for a Theory of Inference

culture will know what constitutes a hockey game, a cocktail party, or a graduate student seminar. The regulative rules, on the other hand, set the conventions or the rules under which one operates in a particular setting. The behavior of participants visiting a friend in hospital will differ from their behavior on a picnic outing.

The constitutive and regulative rules are cultural in nature and are thus shared by the participants to govern the performance of appropriate acts. A knowledge of these rules prepares the participant to anticipate and understand what others in a situation may do. A large part of the interpretation of visual input (text) is provided by the knowledge of what the message must be, rather than from information contained in the input itself. This extra information comes from the context from which the visual input takes its meaning. Context supplies the rules underlying the construction of our perceptual world, tells one what to expect, and gives plausible interpretations of what is being perceived. The reader is heavily dependent on his experiential background to decode what he is reading. If the people, places, events, and objects encountered by the reader are unfamiliar, unrelated to previous experiences, then he will have difficulty reading about them even though the language elements may be familiar. In general, the context utilized for the present study was the city of Edmonton in Alberta with half of the inference passages relevant to the Alberta context while the other half were relevant to a Newfoundland cultural background. The implications of the importance of the specific context evoked by the passages on the reader's performance will be discussed under the reader and encounter components.

Reading Situation

The situation in which a reader finds himself in terms of the temporal and spatial location and task demands is identified as the reading situation. The nature of the reading situation may vary depending upon the purpose(s) which may be established by the reader or for the reader. The reader may come to a reading situation with two general types of purpose. He may intend to understand the writer's intended message or he may have some other intention such that he does not intend to understand the writer's intended message. The extent to which the reader is successful will be influenced by the degree to which the reader is familiar with the context in which the reading situation takes place, by his knowledge of the writer, and his familiarity with the language used. It is more likely that a reader will be successful in understanding the writer's intended message when the writer is a close friend and the text is a personal letter, than when the text is a political treatise and the writer who is unknown to the reader expresses his ideas in a very subtle and abstract manner. All reading done should be purposeful for two main reasons according to Burns and Roe (1976:229):

(1) Readers who are reading with a purpose tend to have better comprehension of those things for which they are reading rather than those who have no purpose. Purposes or questions offer readers a mental set for approaching the reading material.

(2) Readers who read with a purpose tend to retain what they have read better than those who have no purpose.

The purpose for which a reader reads has a great deal of influence on comprehension. Smith (1967) listed seven purposes for

reading including reading for enjoyment, intellectual demands, utilitarian purposes, socioeconomic demands, vocational or avocational interests, personal social needs, problem solving, and personal stimulation. A reader's purpose is achieved when he has been successful in finding a particular piece of information or solved a problem or has fulfilled the purpose which he set in his reading. In some reading situations the reader's performance may be observed as was the case in the present study. Since the ultimate purpose established by the researcher was to have the readers generate inferences and to discuss their rationale for doing so, the most efficient and effective means was for the investigator to assume the role of an observer. In some reading situations no observer is present. Furthermore, when an observer is present the role of the observer may vary depending upon the reading situation. In the situation devised for this study, the observer assumed an interactive role with the reader. The reader's performance may vary for particular reading tasks depending upon the nature of the task (reading a story section to answer a question, reading an encyclopedia to prepare a project report, reading a text passage for assessment, etc.) and upon the reader's familiarity or unfamiliarity with the writer, the text, and the observer.

The task and task demands in the reading situation in the present study, consisted of a set of passages divided into sections which the reader was requested to read and then to tell what he was thinking and to answer questions. The investigator adopted the role of a participant observer, in much the same way as a teacher might do

in a classroom situation. The study was carried out in the school setting and during school hours.

The Writer

Without a writer there cannot be a reading situation. When a writer is planning an utterance, he has many options which can be classified into three categories: propositional content, illocutionary content, and thematic structure (including syntactic choices). The writer (author) must consider the appropriate linguistic device to relay his intentions to the reader; also the writer must consider how states or events are to be initiated; and how much the reader already knows about what is being written.

The basic ideas (units) that writers want to express, the core of the sentences to be constructed, are its propositions. Prior to the writers being assertive, interrogative, assurative or authoritative, they must have something to say. There must be a propositional content (taken from the cultural context) to convey what the writer (author) has to say which will denote states or events, denote facts about states or events, or qualify parts of other propositions. The writer has to decide on the sequencing of the context (Clements, 1976) and on the specific syntactic structures needed to express relationships (Fagan, 1978). In addition, he has to decide what is to be subject and predicate (thematic structure) which specify what is being talked about and what is being said about it. Given and new information specify what the reader already knows and what he is expected to be able to identify uniquely from what he doesn't yet

know. The frame (first main phrase) and insert (the remainder of the sentence) are normally the points of departure that the writers plan for an utterance. The frame is what they are talking about (the subject); and that in turn is usually information known to their readers (the given information). The writer must also decide in planning a sentence what force he wishes to give to the utterance he intends to make, which is its illocutionary force. The choice of the illocutionary content is very important to the focus of the discourse. For example, take the semantic content of the proposition expressed in 'Harry will be here!' This propositional information can be expressed as:

1. Harry will be here.
2. Will Harry be here?
3. I warn you Harry will be here.
4. I bet you Harry will be here.

Each of these has a different illocutionary force. Sentence one usually has the force of an assertion while sentence two has the force of a request for information. Sentence three has the force of a warning and sentence four illustrates the force of a commissive. Each utterance has an illocutionary force which may be specified (directly or indirectly) by the syntactic structure of the utterance. When the illocutionary force is not indicated by the words of the writer's utterance (as in sentence one and two), then the reader must infer the force from the context, if full meaning is to take place. The illocutionary force may be explicitly stated as in sentences three and four.

The details of language structure and the nature of the processes involved in its use are greatly affected by the need to

transmit meaning through a sequential medium. The goals of the writer operate along many dimensions simultaneously, thus there are a variety of mechanisms which make it possible to merge multiple messages into a single structure. The language in the text is also dependent upon the situation as to whether it will be expressive (revealing the writer's psychological state about something) or rhetorical (directed toward producing a change or action).

If the writer is to convey his message successfully, then he is bound by certain principles of communication. These contentions for successful communication are termed by Grice (1967) the "Cooperative Principle" and are represented as maxims:

1. Quantity: Be as informative as is required but no more than the situation calls for.
2. Quality: The information must be true or you should have adequate evidence for asserting it.
3. Relation: Be relevant to the ongoing situation.
4. Manner: Avoid ambiguity or obscurity and be orderly in the presentation. (p. 46)

Armed with the various resources discussed above the writer designs an utterance anticipating how the reader will interpret it and the reader interprets it in light of the hypotheses about the writer's intent. This reflexiveness (mutuality) is one of the most significant features of natural language and must be taken into account explicitly in order to cope with any notion of meaning. In the present study, the cooperative principles were adhered to as far as possible in the construction of the inference passage. The writer provided sufficient information to allow the reader to get an overall schema for the passage. The information in each passage was an accurate representation of the topic being dealt with. Each passage

was written in a manner which just presented the general characteristics of the situation gradually developing into the specifics of that situation. Though principle four was slightly modified in the composition of the inference passages, the passages were presented in a well-organized and coherent manner. A degree of ambiguity was deliberately embedded in each of the passages to foster the production of inferences in an attempt to identify the inferencing strategies used by the readers, as well as to identify whether differences existed in the strategies utilized by the very proficient and less proficient readers.

The Text

In the case of a reading situation, the text is the print used to convey a message. It includes the orthographical features of words, the actual lexical items, and their arrangement into units of meaning. Researchers have described texts in various ways.

Kintsch and Van Dijk (1978) propose that the meaning of a text may be represented by means of a structured list of propositions which must include first a predicate, or a relational concept, and one or more arguments. The description of the language (in this case propositions) is constrained in that it is logically dependent on the specifications of this system. These constraints are imposed both by linguistic rules and general world knowledge and are assumed to be a part of a person's knowledge or semantic memory.

The text base is a coherent, structured list of units (propositions) which are referentially ordered. These propositions

in the text base are coherently organized around the topic being dealt with and thus represent the surface meaning of the text. Propositions are arranged in the text base according to the way in which they are expressed in the text itself—which should be referentially coherent. Accordingly, sentences are assigned this meaning and reference not only on the basis of their constituent components but also relative to the interpretation of the preceding sentences. Thus new information is related to the information one already has either from the text, the context, or from one's general knowledge system (schema). This process is consistent with Clark's 'given-new contract' (1977) in that it is essential that the facts themselves be related. The particular interpretation that is given to an extended message (text) depends on the way it is contextualized and understood through one's personal schematic view and is dependent on one's purposes. Kintsch believes that the new information in a text will be understood more readily if it has recently been preceded by related information, suggesting further that a text will be easily understood if the incoming arguments can be related to the knowledge already in memory.

Certain arguments of a text are more important when interpreting an author's message. Whether or not a reader makes an inference at the time of comprehending will depend upon the importance of that inference to the message as a whole (Bransford and McCarrell, 1974; Schank, 1975; Brewer, 1977; Bower, 1976; Harris and Monaco, 1978; Stein and Glenn, 1978).

A second view of text is based on Searle's (1969) work. He

believes that the propositional content of an utterance contains the units of meaning that reflect the ideas that the writer wants to express, which he terms the propositional act. Searle delineates the following as the constitutive acts of a speech act:

Phonetic act } Utterance act
Phatic act }
Propositional act
Illocutionary act
Perlocutionary act

The utterance act, composed of both the phonetic (orthographic in written language) and phatic acts, is understood to be the uttering of words and sentences. The illocutionary act (as expanded on in the section on Writer) refers to the force of an utterance (I warn you that it is dangerous) and the perlocutionary act refers to the consequential effects that result from having said something.

Searle's (1969) propositional act is similar to Kintsch's (1974) notion of proposition (idea units which represent a single idea). Searle's propositional act conveys the conceptual content of an utterance and Kintsch's propositions are composed of concepts. However, the manner in which their form is expressed, differs. For example, Searle's propositional acts are represented in ordinary sentence form:

I will be there.

It is dangerous.

while Kintsch's propositions are represented as an abstraction of the concepts and their relationships:

(series, encounter)

(violent, encounter).

A third view of text derives from the Semantic Potential Theory of Language developed by Fagan (1978) which specifies three categories of information that may be communicated in language. The first category was identified as denotational which consists of single word elements such as nouns, verbs, adjectives, and determiners; and the basic syntactic structures in which the lexical items are arranged. The second category identified as relational information refers to the functional aspects of words such as direct and indirect objects, verb, subject and subject complement which are signalled by the order of the words within a syntactic unit. The third category, text relations, implies relations within propositions which should reflect relations across propositional units. The first set of textual relations labelled as referential includes pronouns, repetitions, synonyms, class inclusion, derivation, inclusion, and formal repetition. The second set of textual relations labelled as logical relations between propositions includes spatial, conditional, conjunction, temporal conjunction, temporal disjunction, contrast, and comparison. Thus Fagan's (1978) conceptualization of text is similar to that of Kintsch. Like Kintsch, Fagan maintains that the basic unit of text is the proposition; he differs from Kintsch in its formulation. Whereas Kintsch maintains that the proposition is entirely semantic and is identified on semantic grounds, Fagan believes that the proposition, though semantic in content, may be specified syntactically and consequently he has identified twenty-three syntactic structures which are supposedly in a one-to-one relationship with the semantic proposition which they represent.

Fagan's notion of text cohesion in terms of connective propositions and the superordinate and subordinate relationship of propositions also corresponds to Kintsch's ideas in this area.

A further view of text is presented by some researchers (Bower, 1976; Mandler and Johnson, 1977; Stein, 1978) who have attempted to represent text cohesion in terms of story grammars which formalize story structure. Simple stories (text) have a very definite "structure"; that is, they have a constant set of abstract constituents such as setting, characters, plot, episodes, resolution, and so on, all of which are put together in a principled way so as to make a coherent whole (Bower, 1976:512). Readers have a schema for understanding story structure. Rumelhart (1975) proposes that people build up a hierarchy as they listen to stories, identifying each unit (sentence usually) as some part of this hierarchy such as the setting, event, action and so on. Essentially what they have done is constructed a global representation for the story. This global representation or framework serves to facilitate one's interpretation of new stories (text) and also to direct the construction of a new story (text) or the retelling of a series of real life episodes which are considered to comprise a story.

Research carried out by Bower (1976) on story understanding and recall revealed that a more coherent story is remembered better than the narration of a series of unrelated events. Plausible explanations for this finding are that the coherent story fits the story frame (schema) so well that the reader's predictions are confirmed consistently. In addition, the story consisting of

unrelated events restricts the reader's retrieval cues which prompt recall. Finally, the redundancy of interconnectedness of the text components in the coherent story promotes greater recall than in the narration of unrelated events.

From the four views of language presented here it appears that in the development of a text one may represent the units of meaning in various ways, the writer's choice being dependent upon his purpose. From these four analyses of language, the writer abstracted components for the construction of the inference passages. The notion of the information being referentially coherent as suggested by Kintsch and Van Dijk and the notion of the new information being related to that which is previously known were recognized to be critical elements in the construction of the passages for the present study. The conceptual content of an utterance as suggested by Searle is reflective of the type of utterances used in the present study. The representation of information in ordinary sentence format is more representative of the type of reading material students are confronted with in the school setting, so Searle's representation was chosen for the present study. The basic declarative type sentence was used throughout the development of the inference passages which is a sentence type identified by Fagan under sentential information. The inference passages in this study were written according to a definite structure as suggested by Mandler and Johnson. Each inference passage consisted of a setting, at least one character, a plot, episodes, and resolution. While the researcher recognizes the attributes of each of the four theories presented, only those pertinent

to the present study were selected.

The Reader

The reader has a reality which is the life he is living. He has himself and the world outside of himself which he takes in through his senses and refashions in his brain according to whatever has happened during past experiences. Prior knowledge influences everything that the reader perceives in terms of what to expect, what is important, or what is unusual. A reader's expectations about a linguistic event are derived from three sources: (1) his knowledge of the world, (2) his knowledge of language and various linguistic rules, and (3) his knowledge of what has just been perceived. Bartlett proposed this notion in 1932 when he suggested that readers impose a conceptual schema onto the information they receive and this later guides reconstruction of the story. Thus the reader imposes organization on the world around him.

Everyone has a mental framework based on cultural experience into which new facts are fitted. This mental framework or cognitive structure or one's schemata (Bartlett, 1932) or script (Schank, 1975) or schema (Kintsch, 1974) or conceptual framework (Norman and Rumelhart, 1975) imposes a structure on the information one receives which guides later reconstruction of experiences. Each fragment of 'new' information is connected to one's schema in an organized fashion. Schemas are developed as a result of repeated experiences (either direct or vicarious) in a particular context so a pattern is constructed which constitutes a framework of what is usually the case

and of what can be expected to happen in a given situation.

New information is entered in the system in some orderly way and since schemas are developed by experiences and since everyone's experiences are different, then the schemas which are developed are unique. Neisser (1976) has developed the notion of a schema as an anticipatory framework that prepares the perceiver to receive certain kinds of information and not others. This notion can be illustrated by the fact that an automotive mechanic will see and hear faults in a car's engine whereas an automotive body mechanic will be more sensitive to the exterior condition of the car rather than its engine. Neisser sees schemas as not only "plans for perceptual action [but also] readiness for particular kinds of structure" (p. 21). So if information is new and it is meaningful, it is likely to change one's existing knowledge structure or increase the scope of the cognitive structure, perhaps shifting relations of superordinate and subordinate structures.

Gordon, Hansen and Pearson (1979) emphasize that it is not sufficient only to have prior knowledge but that a reader must also have the ability to relate it to the text. So a reader's ability to extract relevant information and make necessary inferences depends on a wide variety of stored information, including knowledge about the world, pragmatics, causality, and author-reader conventions (Grice, 1967; Just and Clark, 1973; and Haviland and Clark, 1974).

The dependence on prior knowledge in discourse comprehension has been depicted magnificently by Schank and others working in the field of artificial intelligence. They found that computers could

not make sense out of even brief rudimentary discourse since the computers were unable to make any inference at all. Possibly a reason then that so little progress has been made on the effects of prior knowledge may well be that "investigators have lacked theoretically interesting and empirically useful ways to characterize people's existing knowledge" (Pace, 1978:3).

A plethora of terms in the literature such as "background knowledge," "common sense knowledge," "world knowledge," and "experiential knowledge" have all been used to refer to the knowledge which the reader possesses before reading. This is not to suggest that prior knowledge is static, but rather to emphasize that it is always dynamic—just as life itself is constantly ongoing. This prior knowledge includes knowledge of the world, knowledge acquired from sensory stimulation, knowledge gained from experience, and also through previous reading.

Not only is prior knowledge not static, but it does not exist in isolation within the reader or the writer. Kjolseth (1972) maintains that participants in a meaning situation must have shared knowledge such that "(1) it is possessed and sanctioned by a more or less inclusive population of members, (2) it is known in a particular mode of relevance, and (3) it has a socio-temporal locus of relevance" (p. 61).

In order to understand the sharing that takes place between the reader and writer, it is important to understand the nature of the knowledge that may be shared.

According to Scheflen (1973), the recognition of acts or

what he terms meaning, is culturally based or possibly a more accurate term would be subculturally based.

> A given tradition has a characteristic repertoire of words, gestures, and structural arrangements for the communication of meaning and the meanings of these behaviour forms are culturally specific. (1973:45)

This supports within the writer a contention that in addition to there being a general type knowledge that is generally shared by all, there also exists a kind of "cultural or typical knowledge." This "cultural knowledge" or "typical knowledge" is felt to be knowledge that is subculture specific, in that, it is knowledge shared only by those having lived in that particular given cultural tradition. For example, there is knowledge that only those people having lived in subculture "A" know, as there is knowledge that only those in subculture "B" would know in their given life times. This knowledge may be depicted as presented in Figure 3.

Further support for the "cultural" or "typical" knowledge which is being proposed is available from Sherif (1936). He stated that what people perceive and how they conceptualize their perceptions is overwhelmingly influenced by culture. As H. M. Tomlinson (1935) says, we see things not as they are but as we are. In fact, Childe (1952) has shown how the Babylonian conception of space is as different from the Euclidean as is the Riemannian, and also how the thinking of the ancient Egyptians and Sumerians ignores the principles of identity, noncontradiction, and causality of the Kantian type. As Childe says:

> Human minds are not . . . mass-produced machines into which uniform experience has only to be fed for them to turn out uniform thoughts. (p. 18)

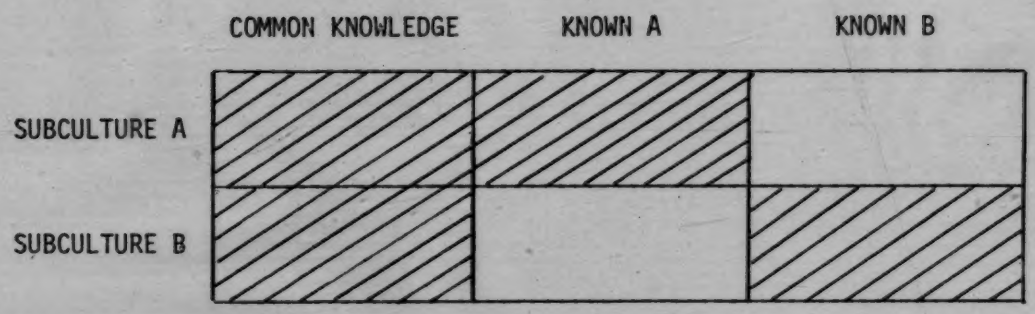

Figure 3

Illustration of Cultural or Typical Knowledge

Whether knowledge is general or cultural specific, not all of it may be relevant to a particular reading task. Kjolseth (1972) depicts degrees of relevance of the knowledge possessed by a reader which he describes to be in terms of four bases of knowledge: background, foreground, emergent ground, and transcendent ground.

To assume that all readers must share a certain background knowledge means "what anyone knows is always relevant anywhere and anytime" (p. 61). This implies that there is a general knowledge that participants must have in order to understand utterances. Foreground knowledge, the second type, is thought of as that which is always relevant in a particular time, "what anybody knows is categorically relevant to the duration of this setting" (p. 62). In terms of reading, the reading situation embodies a particular topic for which the reader must have some specialized knowledge shared with the writer. Thus, foreground knowledge is important in terms of the specific reading task. This knowledge is applied to the actual utterances in order to understand the message by means of a constantly evolving situation. Thus the initial contact with a reading task should evoke a particular knowledge schema. This interpretation of utterances by means of background and foreground knowledge results in a knowledge of the emergent ground, or how each part of the particular situation has evolved to the present moment, and knowledge of the transcendent ground, or how each part of the situation or episode will most likely evolve in the future. This potential knowledge or transcendent ground is the relating of new information to old which immediately becomes part of the reader's prior knowledge and is applied

to the text as it continues to unfold. Giboney (1979) considers these knowledge bases as intersubjective knowledge and depicts them as presented in Figure 4.

However, since individuals may identify with a particular cultural group, the four areas of intersubjective knowledge will vary depending upon the cultural background of the reader. Thus whereas all readers will share some knowledge, there is cultural specific knowledge which will differentiate cultural groups. Thus the knowledge required for a particular reading task will vary for readers from different sub-cultural groups.

The reader's prior knowledge has a forceful impact on both the kind of information that is synthesized and on the degree of synthesis. The reader can either reject or accept new information; acceptance means a cognitive restructuring, "The more cognitive restructuring a piece of information is likely to necessitate, the less likely we are to believe it; we have a great personal investment in the way we organize our knowledge of the world" (Smith, 1971:192).

Factors other than prior knowledge will also influence the manner in which a reader encounters text. One such factor common in an academic setting is the subject's level of proficiency as a reader. If this is the case, then it would be expected that readers of different levels of proficiency would utilize different strategies in comprehending texts. In a study by Weiner and Cromer (1967) with fifth grade readers approximately two years below the appropriate grade level for their age, it was found that to read effectively there

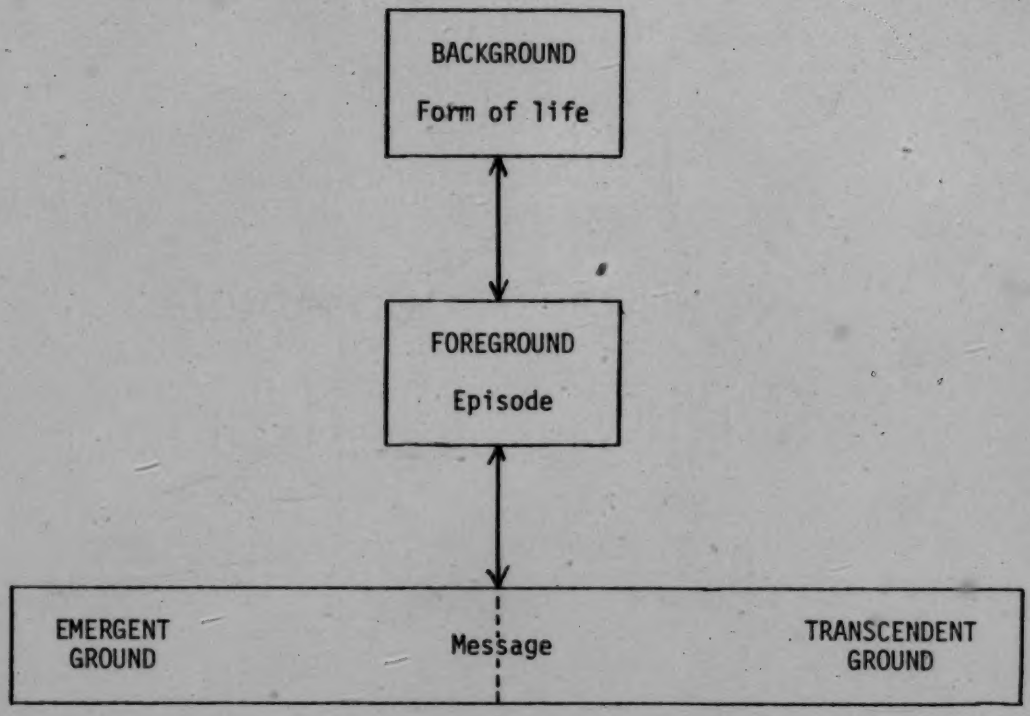

Figure 4

A Model of Intersubjective Knowledge
(Giboney, 1979:188)

has to be a matching or agreement between the cues available and the response characters of the individual. Previous to their study researchers looked at intellectual ability, visual discrimination, and psychological disturbances in attempting to account for reading difficulties, thus the emphasis was on what the child could not do. However, within Weiner and Cromer's framework differences between good and poor readers were attributed to: (1) differential discriminations of input with both groups discriminating different cues in the material; and (2) differential elaboration of the cues with both groups differing in their pattern of (cue) elaboration which may or may not match the printed material.

The results of a study by Schienbien (1978) revealed that both good and poor readers can and do make inferences. McLeod (1978) found that less proficient and very proficient grade four readers differed significantly in their ability to link the inference to the text such that it "makes sense."

High reading achievers made earlier correct predictions than did low reading achievers in grade four (Inglis, 1974). This finding corroborates the research of Goodman (1973) who found that proficient readers are both efficient and effective in utilizing the textual information and their own experiences. It seems as if the effective readers get the most meaning out of a task by being highly selective, capitalizing upon only enough clues to get to the meaning. Whether the readers would make the main inference early or late in terms of level of proficiency and familiarity or unfamiliarity with the text was a question investigated in the present study.

The sex of the reader was not believed to be of major importance in the present study as the topics selected for presentation, Sports, Recreation, and Occupation, are general topics and thus believed to be unbiased in favor of either sex. Nevertheless, equal numbers of boys and girls were chosen to participate.

The intellectual ability of the reader could also be a factor in determining the strategies that are used and was controlled such that only those students in the average range of intelligence were selected. It was believed that those students would be most reflective of the average student in a reading situation. Other within-reader factors could also be influencing variables. Reader's purpose, for example, is another very important factor, which was discussed under the component reading situation.

The present study controlled for sex and intelligence ability. The factors within the reader examined were the reader's level of reading proficiency and his familiarity or unfamiliarity with the inference passages.

The Encounter

Encounter in general is defined as the interaction between the various components of the model. In a reading situation, the reader is part of a broader environmental context and encounters the text and its writer. The reader's encounter with the text is based on information from prior knowledge, the text, and various mental processes.

Comprehension is a set of procedures that involves selecting

one's personal experiences or knowledge of the world as they relate to the surface structures of sentences to yield meaning. In so doing, the reader develops, absorbs, and incorporates, or perhaps 'imagines,' the meaning suggested by the sentence. Thus comprehension cannot be seen as an independent process, but rather as a collection of processes—some independent, some overriding, and completely related to other processes. Actually, the interaction between prior knowledge and text information can be argued to be reading comprehension. This prior knowledge allows the reader to interpret, analyze, synthesize, appreciate, and evaluate as he reads.

Royer and Cunningham (1978:4) propose the "minimal principle" of reading comprehension which states "the act of comprehension entails an interaction between an incoming linguistic message and the comprehender's world knowledge." This principle may be dichotomous in the sense that it may be either strong or weak. The weak form of the principle pertains to the perceptual processes in reading. The reader makes use of prior knowledge to identify features in letters, to attach sounds to letters and spelling patterns, and to identify words and meanings. Thus the act of comprehension in this weak form necessitates a process of linking together a sequence of derived word meanings until a unit (sentence, phrase, proposition) has been attained and then proceeding on to the next unit.
The strong form of the principle proposes that the letter and word identification processes in the weak form merely 'set the stage' for the act of comprehension. Beyond these processes, there is another kind of interaction between the linguistic message input and prior

knowledge which must occur before the reader forms a firm representation of what is being read. This additional form of interaction operates on larger units (though word identification and word meaning are affected) and is responsible for the "click of comprehension."

The distinction between the strong and weak form of the minimal comprehension principle may be considered in terms of Clark and Clark (1977). The weak form likened to a reader's dictionary, would consist of a mental storehouse of information about words, with each word in a reader's dictionary having three entries: the pronunciation of the word, its syntactical category, and the meaning of the word. The strong form likened to the reader's encyclopedia, would contain all of the reader's world knowledge as it relates to words. So for example, one's encyclopedia entry for the word "quintal" might contain information about weights, volume, uses of the term, history of usage, typical use of, and experiential facts.

Processes have been defined in different ways by several researchers. Das et al. (1975) posit two different forms of mental organization for coding incoming information, the first being simultaneous processing (carries out many activities concurrently), and the second being successive processing (constructs only one thing at a time). The information integration resulting from these two forms of mental organization is used by the decision-making and planning component, and all three, the simultaneous, the successive, and the decision-making and planning facets comprise the three major components of the central processing unit (Das, Kirby and Jarman, 1975). Factors such as the socio-cultural, genetic, and task demands

influence one's mode of processing information. As the reader interacts with the text, he engages in a number of "processes" which mediate between the text, the reader's prior knowledge, and the output, which in this study are the resultant inferences.

Given a text, the reader must first understand the problem identified for him or by him (purpose for reading). Understanding the goal, the conditions imposed (reading situations), and the data (textual information), the reader must plan a solution. Based on the foregoing discussion, it seems that a reader has available two approaches which may be used to describe a text encounter. The text-based (bottom-up) approach is similar to successive processing where the reader gradually attains an inductive understanding of the overall structure and meaning of the text. The reader decodes each word, then each sentence. In this kind of processing, the reader is tied to the exact details of the text.

In a schema-based (top-down) approach where the reader may adopt simultaneous processing, the reader uses the text as the stimulus to activate his prior knowledge to intuitively set up expectations about the text into which new information is assimilated and to impose a structure on a text.

Within any reading situation, however, the reader may use either or both of these approaches depending upon the demands of the situation.

Reader-Text Encounter

Since reading is an active process, self-directed by the reader for many purposes, the reader alters the manner in which he processes

the discourse to meet the demands imposed by a particular discourse or communication context. Comprehension in reading involves using a set of procedures that allows the reader to select from his personal experience and knowledge about the world, those concepts or ideas that are relevant to the immediate text and consistent with his purposes. Therefore, as a reader works through a text, he often elaborates on what is implied by the author and arrives at intended inferences. This process is referred to as inferencing and is often described as "reading between and beyond the lines." Inferences perform at least two basic functions. In the first place, they allow the reader to extend and enrich the explicit meanings intended by the author. Second, inferences connect the explicit events with the events which are not explicitly treated by the author, but rather left as understood or implicit. Yet if such inferences were ignored by the reader, their absence could detract from the richness of meaning inherent in the text. Thus, the reader must construct the meaning intended, on the basis of the textual information given, as governed by the reader's prior knowledge, and by that form of knowledge which is relevant at different levels of involvement.

As long ago as 1917, Thorndike pointed out that to be able to understand even the most simple text well enough to give reasonable comments about the information it contained, necessitates an active process of selection and inference and an appreciation of the various concepts in relation to one another. Inference makes it possible for the reader to go beyond the information which the author communicated (Goetz, 1977) and is an integral part of the

comprehension of and memory for text (Bransford and McCarrell, 1974; Schank, 1975; Brewer, 1977; Harris and Monaco, 1978). Inferencing is dependent upon relating the text information to prior knowledge (Bransford and Johnson, 1973). Prior knowledge is crucial since one cannot understand an utterance (text) unless one knows what is being talked about, and in order to grasp what the speaker intended, one must relate utterances to prior knowledge and to one another (Bartlett, 1932; Rommetveit, 1971; and Giboney, 1979).

Perhaps some of the most recent and extensive work in delineating the process of inferencing has been conducted by Collins et al. (1977). They hypothesized that readers would engage in an inferencing task differently depending on whether they encountered the task through a schema-based or text-based approach.

Based on the processing revealed by the subjects' protocols in their study, Collins et al. (1977) found that each new portion of information from the text was assimilated to the reader's framework in order to construct more refined models of the text. In general, assimilation of new information is accomplished by filling in intervening structures based on the characters' goals and intentions, and making alterations to the original structures where necessary. Readers deduce questions from the empty variable in the world knowledge schemas that are triggered by the understander's attempt to build a coherent goal-subgoal structure.

The process by which readers converge on a model that answers their questions involves 'constraint satisfaction' (Bobrow and Brown, 1975; Fikes, 1970; Waltz, 1975). In revising their model of a text,

readers employ a variety of problem solving strategies which Collins et al. compare to the strategies people use to solve crossword puzzles. Basically the theory states that readers try to understand the actions and events in a text in terms of characters applying a "means-end analysis." Newell and Simon (1972) explain that this analysis functions as follows: (1) assuming all the preconditions are met to reach a goal directly by a particular method, then apply that method; (2) if the preconditions are not met, then generate a subgoal to fulfill them; (3) having generated this subgoal, then apply means-end analysis repeatedly to unfold that subgoal; (4) in the event that the preconditions as perceived cannot be fulfilled by that method, then pursue another method. Thus, means-end analysis places certain constraints on the acceptable structures that interrelate events in the text. It is important to point out that even within these constraints there are still 'potentially infinite' sets of plans or solutions to a problem depending on the particular subgoals and methods pursued. The initial model is a partial model which is constructed from schemas triggered by the beginning elements of the text. Successive models include more and more elements of the text which are progressively being refined to complete the model.

A significant contribution of the research by Collins et al. was the identification of five strategies as means used by readers to arrive at inferences in text understanding. The initial assigned interpretations may be considered as the reader 'binding' the information on the basis of the data present and his prior knowledge. This interpretation or binding may or may not be maintained dependent on

subsequent strategies which may be brought into play. The strategies as identified by Collins et al. (1977) are as follows:

1. The first is a strategy termed "rebinding" which is basically a procedure whereby if a word, sentence, and/or proposition generated by the reader leads to conflict then 'rebind' or try a new word, sentence, and/or proposition.

2. In the event the reader is unable to rebind (having made a false assumption), then pursue another interpretation based on the clues (information) provided. This strategy is particularly important, in that an incorrect interpretation can interfere with the reader arriving at an acceptable solution.

3. As the reader continues to read direct and/or indirect conflicts may arise, at which point the reader must then question bindings and then possibly have to change his focus.

4. This shift in focus affords the reader a new perspective by addressing a different question when in trouble, such that previously accepted assumptions are relinquished. This strategy is workable because the answer to one question sets up constraints for other questions.

5. The reader in an attempt to have the model converge (make sense) will often make tentative assignments as a means to constrain the possible solution and then systematically consider the alternatives possible which is really constraint satisfaction.

To illustrate the complexity of the inferencing processes, a passage used in the Collins et al. (1977) study is presented. The subjects were read the following passage:

Window Text

> He plunked down $5.00 at the window. She tried to give him $2.50 but he refused to take it. So when they got inside, she bought him a large bag of popcorn (p. 3).

They were then asked to describe how they processed the text, whether they had any intermediate hypotheses along the way, whether they were satisfied or not with their hypotheses, and why. The passage was divided into several stages and Figure 5 attempts to demonstrate the progressive stages of understanding and how these stages encompass the goals and intentions of the characters. The first stage consists of a set of pending questions that arise from the man putting down $5.00, such as "Who was he?", "Why did he do it?", "Where was he?". Many of these questions are answered as the reader's understanding progresses. The second stage reflects the notion that the man is putting down money toward the goal of buying something for which the money is payment. The third stage reflects the full notion that the man's goal is betting on a horse at a racetrack. At this point, the reader has constructed an initial model of the text (p. 10).

The next three stages show how new information is assimilated to the initial model. Stage four again consists of a set of pending questions about who tried to give whom $2.50, why they did it, and this event is connected with the first event. Stage five proposes some tentative inter-relations between the two events: "she" must be the racetrack employee who received the $5.00, and "him" must be the man who plunked down $5.00. In stage six the new information is fully assimilated by constructing a goal for the employee of returning change to the man. This presupposes that the employee took the $5.00

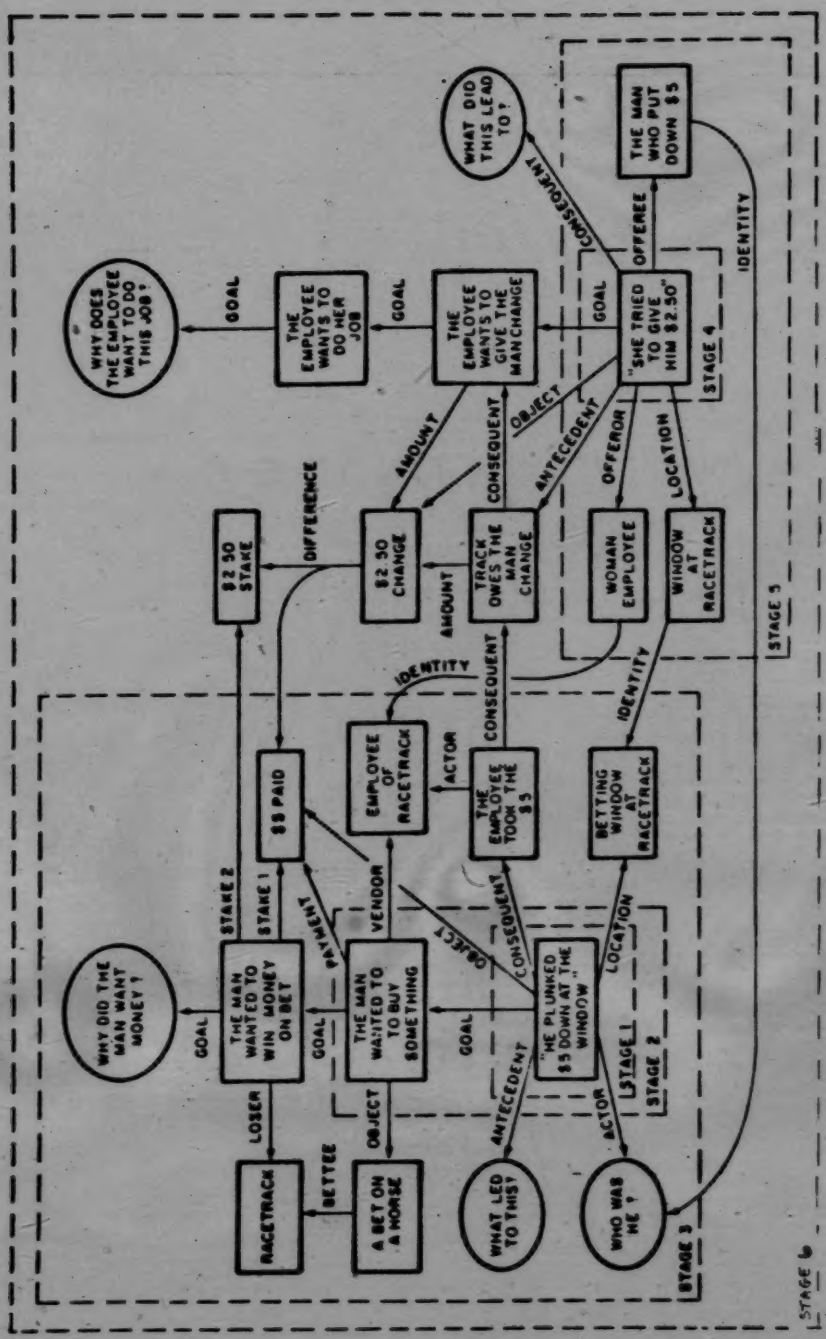

Figure 5

Stages in Inferencing
(Collins et al., 1977:12)

and that the amount of the bet must have been $2.50. Thus the initial model is modified slightly to change the betting stake from $5.00 to $2.50.

The reader, realizing that most of the original bindings are unsatisfactory, begins the process of rebinding which introduces another character (i.e., the man's date) and it is she who wants to give him $2.50 in order to pay for her own ticket to the movie. The process was completely restructured with the addition of each new binding. The reader must now attempt to answer other questions arising out of the model "Why did he refuse the $2.50?", "Why did she go inside with him?" and "Why did she buy him popcorn?". Failure to answer these questions would lead to more restructuring whereas answering these questions would lead to a more refined process. These questions derive from the unfilled variable slots in the world knowledge schemas that are triggered by the understander's attempt to construct a coherent goal-subgoal structure (Collins et al., 1977: 13). The reader then has to re-interpret where the $2.50 had come from, which allows the reader to make more sense of the passage, i.e., the money came from his date who wanted to go dutch but he didn't, and so when they got inside, she bought the food.

In the above analysis of the Window Text passage, the important point to note is that the schema(s) chosen by the reader was dependent upon his prior knowledge structures.

In addition, Collins et al. (1977) were able to specify at least four different tests that readers applied in evaluating the credibility of the models they constructed. Prior knowledge is

(1) the overall base against which the reader can test whether his model is acceptable or unacceptable; (2) the only base against which the reader can attempt to answer his self-derived questions that may have arisen; (3) the only base against which the reader may assess the interconnectedness (if the different pieces tie together in more than one way); and finally (4) the degree of resemblance between the surface aspects of the text and the concepts that the reader perceived to be implied by the text.

"An actual reading situation may be a complex of different basic reading situations such that the reader conceptualizes the same text in different ways, and thereby obtains multiple messages from his reading" (Giboney, 1979:216). This view of reading situations as intentional contextualizations by the reader seems to be relevant to objections to reading models by Gibson and Levin (1975:454):

> No single model will serve to describe the reading process, because there are as many reading processes as there are people who read, things to be read, and goals to be served. Reading is as varied and adaptive an activity as perceiving, remembering, or thinking, since in fact it includes all these activities.

The nature of the encounter in the present study centered upon the inferencing strategies used by the very proficient readers and the less proficient readers in either a familiar or unfamiliar text situation. Ten autonomous inferencing strategies were identified as being used by the readers in this study. These strategies are identified as follows:

1. Rebinding
2. Questioning a Default Interpretation and/or a Direct or Indirect Conflict
3. Shifting of Focus
4. Analysing Alternatives

5. Assigning an Alternate Case
6. Confirming an Immediate Prior Interpretation
7. Confirming a Non-Immediate Prior Interpretation
8. Assuming a Default Interpretation and Transforming Information
9. Neglecting to Respond or Holding Information
10. Empathizing from Experience.

The ten inferencing strategies identified are fully discussed with accompanying examples in Chapter IV.

By considering such factors as the point at which the main inference was made, the source of information used, and the degree of elaboration in the reader's development of the inferences, it was possible to conjecture about whether the readers used a text-based or a schema-based approach in the generation of inferences.

Theory Application as Exemplified in the Present Study

The theory of inference developed for the present study was used to guide the researcher as to the relationship of components necessary to the reading act. In testing the theory only segments of selected components were tested yet the power of a theory is that it allows one to see in perspective those components that are not tested as well as those that are.

The context of the present study was the City of Edmonton in the Province of Alberta. The context was an important component in that the Albertan environment in terms of its cultural setting established the topics for composing the background plus inference passages. The topics are representative of the Albertan setting in reference to sports, recreation, and occupation. It is plausible to assume that these topics would not have the same degree of relevance

to readers in other contexts, such as Nova Scotia or California. The parallel topics comprising the background minus passages were established within the confines of a Newfoundland cultural setting and would constitute the elements of unfamiliarity for any persons not living, having lived, or done extensive reading in or about that setting for an extended period of time. If the researcher were to replicate the study in Newfoundland then the passages designated as familiar in the present study would have to be alternated with those designed as unfamiliar by reason that the latter would be relevant to the Newfoundland subjects and consequently have to be categorized as background plus. If the researcher were to replicate the study in any place other than Alberta and Newfoundland then all six of the inference passages in the present study may have to be regarded as background minus for the subjects; depending on the subjects' familiarity with the topics involved.

While the context or state of affairs in which the communication takes place is of essential importance, the reading situation is the basic of the two. Eight particular classrooms in eight specific Edmonton schools were part of the reading situation in the present study. The reading situation engaged one subject and the investigator at any one time. The investigator assumed the role of observer. A degree of latitude was present in that the observer interacted more with some readers than with others depending on the clarity of the reader's introspection and rationale for making a particular inference. The classrooms in which the study was conducted were relatively free from distraction and the investigator (observer)

attempted to maintain a relaxed and amiable manner throughout the sessions. All situations in which readers read do not necessarily involve an observer nor would the degree of participation by an observer be consistent. Consider the following reading situations: a classroom where the teacher is listening to a reader and recording miscues for diagnostic purposes; a group of students answering specific comprehension questions to be corrected by a teacher upon completion; and a child reading to a parent. In all three illustrative reading situations the nature of the participation of the observer is distinct.

The reading situation can be altered in terms of the spatial and temporal situation of the reader. The reading situation in the present study was within the specified school hours and building. It would seem reasonable to conclude that had the investigator asked the students to come back at night or on Saturday that the same degree of interest and participation would be questionable. In addition, had the students been approached on a bus or during recess it seems that their performance may have been different because the reading situation was different in terms of time and place. Inherent in any reading situation are a reader, a text, and a writer.

A reader brings a wealth of experiences to any reading situation which influences the kind of information to be synthesized and the degree of synthesis as well as influences what the reader anticipates. The reader imposes an organization on the world around him based on his schema or prior knowledge. The reader based on his experiences must have some degree of language facility, an adequately developed conceptual background, an ability to understand, and a system of

learned responses and strategies. While reading depends to a very great extent on the individual characteristics of the reader, the text is the stimulus. In the present study the level of reading proficiency of the reader and the reader's familiarity and unfamiliarity with text were examined. If other factors within the reader had been considered such as interest and freedom of choice in passage selection just to name a few, then different results in terms of inferencing strategies used may have been obtained. In the present study the readers were instructed that their participation was entirely for research purposes and had nothing to do with their school grades. It is conceivable that some of the readers would have performed differently had it been part of their grades in that some of them may not have been as uninhibited. None of the readers had any former acquaintance with the investigator, in this case the writer of the passages.

The readers' performance may have varied had they been familiar with the writer. In a reading situation where the writer plays a more participative role such as in a friendly letter it would seem that both the writer and reader would share a more personal kind of knowledge permitting the writer more flexibility in the choice of words, sentence structure, etc. than in a reading situation where such is not the case. From the reader's point of view in the friendly letter situation, it would seem that the images, feelings, and thoughts provoked by the writer would be consistently confirmed because of the common experience base shared by the two.

In the basic reading situation the reader is unfamiliar with

the writer. In every reading situation there has to be something to read which necessitates a writer. The writer has something to say and must consider how to say it bearing his readers in mind. The writer should proceed from a point that is mutually known to both the writer and reader moving to the inclusion of new information. The writer must be true to the cooperative principles of communication as far as possible depending upon his purpose. The writer's purpose in this study was to compose inference passages which would necessitate the readers generating inferences as a means of identifying the inferencing strategies they utilized. The writer's purpose was identical for all the readers and was made known to them. However, the researcher's purposes as a writer differed from those as a researcher. Though the writer component was not investigated in the present study, the students could share the same purposes as the investigator, for example to see how well they read generally. Since the readers were unfamiliar with the writer, then the reading situation was really one of an encounter between a reader and the text. In addition, the topics were unfamiliar to some of the readers and all the topics were presented in such a way as to facilitate the production of inferences.

The narrative text was used to convey the passage information in the present study. The inference passages were comparable on the basis of established criteria. The inference passages (text) in the present study were constructed in a manner proceeding from the general to the specifics of a topic. Those passages designated as familiar would seem to furnish a greater degree of mutual knowledge with the

reader than those passages designated as unfamiliar. The present study investigated the inferencing strategies used by the readers in a reading situation with which they were familiar with events, places, and objects, and in a reading situation with which they were unfamiliar with events, places, and objects. Though the readers in the encounter which utilized the unfamiliar passages would be familiar with the language elements, they would lack the shared experience base between themselves and the text. Since reading is an active process, self-directed by the reader for many purposes, then the reader alters the manner in which he will process the inference passage (discourse) to meet the demands imposed. The point at which the reader is able to identify an appropriate schema which is compatible with the text would seem to be a factor determining whether the reader made the main inference early or late. Consequently, it would appear that if the readers made the main inference early then the remainder of the text would be more predictable than if they made the main inference late. In addition, it would seem that the readers would be more likely to identify the main inference early in the passages which are familiar as opposed to those which are unfamiliar. Further it would appear that readers who made the main inference early would have a wider store of information accessible to them than those who were more text-bound and thus would be more equipped to expand on the limited information presented by the text.

In the encounter the focus is on the interacting of all the components of the theory and the inferencing strategies used by the readers. The encounter encompasses the interaction of reader, text

and writer in a particular reading situation as part of an overall environmental context. In the present study, the focus was on the reader-text encounter which involved a reader identified as very proficient or less proficient and a text (inference passages) designated as familiar or unfamiliar. The text was written to induce the production of inferences by the readers as a means to identify the inferencing strategies being utilized by the readers. The reading situation in the present study engaged a participant-observer to facilitate the recognition and understanding of the inferences generated by the readers. The theory of inference as exemplified in the present study may be visualized as illustrated by Figure 6.

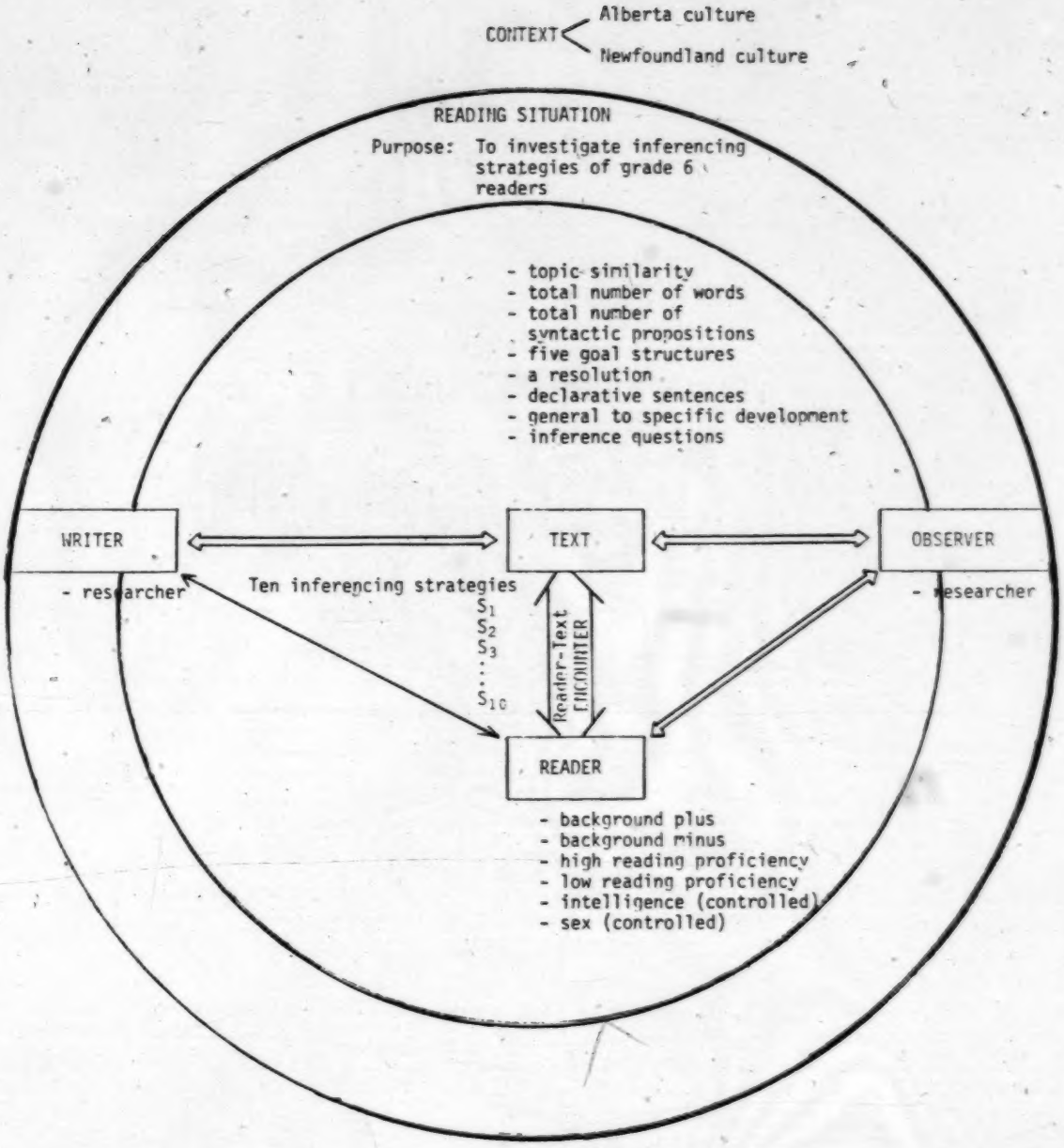

Figure 6

Components of a Theory of Inference as Exemplified in the Present Study

Chapter IV

THE DESIGN OF THE STUDY

Introduction

A description of the design including the sample selection and an account of the research procedures is the subject of this chapter. Divided into six sections, the chapter will describe this sample selection, the variables and the instrumentation fundamental to the study, the pilot studies, data collection, coding, and the research design.

The Sample

The focus of the study was on the sixth grade reader. The results of the research presented in Chapter II indicate that generally by ages ten to twelve years, children have the propensity to apply inferential processes. Furthermore their memory for stories has increased with age accordingly and they can manipulate propositions consistent with Piaget's stages where abstract versus concrete thinking typifies older subjects. In addition, a study by Brown and Smiley (1977) suggested that young children (grade three and less) appear to have limited knowledge about their own cognitive processes and since a principal purpose of this study was to identify the inferencing strategies that children utilize, Grade Six children were chosen for the study. In addition, this study was directed toward the

identification of the strategies used by the maturing reader rather than the mature reader as has been the case in most studies on inference.

The sample for this study was drawn from 1,000 grade six students enrolled in the Edmonton Catholic School System. Students who met the inclusion criteria were separated into boys and girls from which forty students (twenty boys and twenty girls) were randomly selected. The following inclusion criteria were adhered to in the sample selection.

a. Nonverbal I.Q. Score. The Edmonton Catholic School System administered the Canadian Lorge-Thorndike Intelligence Test, Level 3, Form 1 (1967). In an attempt to control for subjects at the extreme ends of the scale on intellectual ability, all forty students were of average intelligence. Students who achieved a score above 83 and less than 113 inclusively (the average range) were selected for the study.

b. Reading Achievement Score. The Edmonton Catholic School System administered a system-wide standardized test, (i.e., The Canadian Tests of Basic Skills, 1977) at the end of each school year. The level of achievement in vocabulary development and reading comprehension was obtained from the files. The Less Proficient reader was defined as a subject who attained a vocabulary and a comprehension score below the fiftieth percentile and the Very Proficient reader was defined as a subject who attained a vocabulary and a comprehension score above the eighty-fifth percentile at the end of grade five.

c. English as a First Language. Only those students for

whom English was a first language were considered for the study. This information was available either from the students' cumulative records or from the teachers.

d. Length of Residency. Since a basic assumption of the study was that the subjects would be familiar with certain aspects of Alberta culture and unfamiliar with certain aspects of Newfoundland culture, it was decided to select only those who had started school in the Edmonton system and for whom complete computer profiles were available.

e. Voluntary Participation. Only those students who volunteered to participate in the study after they were informed about its purpose were considered.

f. Sex of Pupils in the Study. Equal numbers of boys and girls were included.

The following exclusion criteria were adhered to in the sample selection.

g. Language Immersion. Those students who were involved with any type of language immersion program were excluded from the study.

h. Repeaters. Those students who repeated one grade or more in their schooling were excluded from the study.

i. Other Factors. Those students with acute visual, speech, hearing, and emotional disorders were excluded from the study.

It is believed that the factors (g) through (i) could have influenced the inferencing strategies employed which may not be reflective of the strategies one would expect from students without these experiences and/or these types of impairments.

Table 1 illustrates the sample according to school, reading proficiency level, and sex.

Variables and Instrumentation

The Production of the Inference Passages

The instruments used in this study for data collection included (1) the Inference Passages, and (2) Inference and Probe Questions specifically designed to tap the strategies used by readers at both levels of proficiency.

The inference passages were developed by the investigator and consisted of six selections half of which were relevant to an Alberta Background (Familiar) and half to a Newfoundland Background (Unfamiliar). Thus three passages were pertinent to an Alberta Background and three passages were pertinent to a Newfoundland Background.

The Newfoundland Passages were written by the investigator (a native Newfoundlander) who identified the key concepts and verbal labels within a topic and then wrote the passages incorporating this information. Each passage was studied by at least three other Newfoundlanders to ensure that the key concepts and labels were accurately represented as well as to ensure that the actual passage accurately reflected the topic being dealt with.

The Alberta Passages involved the investigator interviewing three native Albertans about topics parallel to the topics of the Newfoundland Passages. These interviewees were asked to identify the key concepts and labels pertinent to the topic both orally and in written form. With this information, the investigator then wrote

Table 1

Sample Breakdown According to School
The Sample (N = 40)

School	Very Proficient		Less Proficient		Total
	Males	Females	Males	Females	
A	2	1	1	1	5
B	1	1	2	1	5
C	1	3	2	2	8
D	3	0	1	2	6
E	0	2	1	1	4
F	0	1	2	1	4
G	2	0	0	1	3
H	1	2	1	1	5
Totals	10	10	10	10	40

the parallel Alberta Passages incorporating this information. Upon the completion of the passages, the native Albertans were then asked to assess whether or not the passages accurately reflected their key concepts and labels, and to ensure that the actual passage reflected the topic itself accurately.

All six passages were written in such a manner that inferences would have to be generated if the students were to comprehend the passages. In order to ensure that the passages designated as familiar and unfamiliar were as parallel as possible, specific criteria were established and used as guidelines in their construction.

1. All six passages were written in the same declarative type sentence structure.

2. Each passage was constructed by first stating the general features of a situation and progressing to the more specific features of that situation.

3. Each passage contained five goal structures.

4. The final segment of each passage specified the outcome of the goal introduced in the first segment of the passage.

5. Length was controlled in terms of the number of syntactic propositions utilized in each of the passages.

6. The overall length of each of the passages approximated 106 words which was sufficient to allow the reader to utilize a schema to get the gist of the passage and to allow the reader to make ample inferences.

7. All the passages were devoid of technical language (such as that employed in law documents or computer manuals).

All six passages were equated on the above seven criteria. They were grouped in two sets of three—the common criteria within each set being familiarity (Background plus) or unfamiliarity (Background minus). The description of the passages as well as a representation of their comparability are provided in Table 2. For copies of the familiar (Background plus) passages see Appendix A; for copies of the unfamiliar (Background minus) passages see Appendix B.

Inference and Probe Questions

A main inference question which was key to the passage was emphasized prior to the students' reading of each passage. The main inference question provided a focus for the students thus allowing them to process the passage in a more efficient manner.

The inference and probe questions were unbiased toward any particular strategy but were designed to stimulate further interpretation if the students did not freely provide the information during the introspection. The same questions were asked of all students if possible, however, depending upon the students' responses oftentimes the questions had to be varied either to seek clarification or to establish a rationale for their answers. Some questions were omitted for those students who provided the inference information independently. To have then asked these questions would have been redundant and undoubtedly confusing for these students. Every attempt was made to provide consistency in the questioning thereby allowing each student an equal opportunity of responding. Copies of the inference and probe questions are available in Appendix C.

Table 2

Inference Passage Comparability

Criteria	Passage Groups					
	Familiar Passage 1	Unfamiliar Passage 4	Familiar Passage 2	Unfamiliar Passage 5	Familiar Passage 3	Unfamiliar Passage 6
1. Topic	Sports (Skiing)	Sports (Randying)	Recreation (Rodeo)	Recreation (Garden Party)	Occupation (Farming)	Occupation (Fishing)
2. Total Number of Words	96	109	112	117	100	106
3. Total Number of Syntactic Propositions	23	23	28	27	20	20
4. Total Number of Sentences	11	11	11	11	13	13
5. Number of Goal Structures	5	5	5	5	5	5
6. Sentence Type	Declarative	Declarative	Declarative	Declarative	Declarative	Declarative
7. Passage Progression	General to Specific	General to Specific	General to Specific	General to Specific	General to Specific	General to Specific
8. Number of Inference Questions	10	10	11	11	11	11

Inferencing Strategies

Ten inferencing strategies* were identified as being used by the grade six students. Each strategy will be discussed singly with examples from subjects' responses. The actual strategy is in parenthesis ().

Strategy 1 - Rebinding. When a reader suggests or hypothesizes a possible interpretation and then immediately realizes that this interpretation conflicts with previous information he then substitutes another interpretation. In essence the reader is "rebinding" the present information to a previous interpretation.

Examples:

Farming Passage

They're using the auger to put it into the graineries (not the graineries but their bins).

Rodeo Passage

In response to question C_2, "Why would Marty need glasses?" the student says

Marty had glasses and he forgot them at home (no he lost them).

Garden Party Passage

In response to question D_1, "Were Mary Ellen and Theresa glad to see Bridie," the student says

Yes, (No) because they were glad they left their camera at home.

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*The five inferencing strategies defined by Collins et al. (1977) were modified and included in the ten identified here. Collins et al. (1977) strategies were discussed in Chapter III.

Strategy 2 - Questioning a Default Interpretation and/or a Direct or Indirect Conflict. When the reader makes an initial interpretation of the input, this may trigger off a knowledge schema which the reader may or may not continue to maintain. However, the reader may have misinterpreted certain data and/or made incorrect assumptions based on the data available. When subsequent information is in conflict, rather than questioning the current information or choice (rebinding), the reader questions a previous interpretation and/or accompanying assumptions.

Examples:

Skiing Passage

(I was wrong about they're going for a hike), they're going skiing because it says he waited in line for the chairlift. (Now I think it's not his first time), he's a pretty good skier.

Fishing Passage

They're fisherman (not sailors or lumberjacks) because it says here that the net was hard to pull.

Strategy 3 - Shifting of Focus. When the immediate question cannot be readily resolved, then the reader may address surrounding but related though not key questions. Frequently a response to such a question will constrain the response to the target question and a correct interpretation will be more readily available.

Examples:

Randying Passage

The kids are all on this hill playing, and they're making

trains but ("What's a coaster?").

Skiing Passage

After reading Episode B, the student asks (What's a chalet?") and ("Why would he be scared?").

Rodeo Passage

I'm confused now cause why would he want to go either to a restaurant or picnic or something outside if he wanted to use glasses? (Unless they're field glasses?)

Strategy 4 - Analysing Alternatives. The reader does not close in on any one interpretation of the data. Rather more than one possibility or alternative is raised and tentatively held until more information is available. Tentative words such as, "probably," "maybe," "or," "might," "I think," are often used with this strategy.

Examples:

Garden Party Passage

They're going (to church or on a trip) to visit their aunt because they're putting on their best clothes.

Skiing Passage

That he was (probably skiing, maybe tobogganning).

(Maybe he's going to do something) (or learn some lesson) (or do something he's never done before).

Fishing Passage

(They might sell the fish) (or they could unload) them and put them in a freezer and go out again.

Strategy 5 - Assigning an Alternate Case. When information cannot be interpreted to fit within existing data, and when subsequent information does not provide a solution, then an alternate interpretation is held in abeyance from other information as a separate thread or strand. It seems as if the reader is dichotomizing his initial schema.

Examples:

Rodeo Passage

The student having already talked about going on a picnic or to a party wonders about the glasses. The student then says "He was going to a masquerade party and he wanted to wear glasses (maybe they were the glasses with the big nose and moustache).

Randying Passage

The student having just read about the new coaster responds to the question C_1. Why did he have to try out his new coaster? (It's the day after Christmas and there's just a few days left before school starts up again so he he wants to try out his new coaster while he has the chance.)

Strategy 6 - Confirming an Immediate Prior Interpretation. The reader interprets a subsequent response so that it is consistent with the response immediately preceding.

Examples:

Skiing Passage

They were skiing (because of the word slope), (I thought about winter and skiing).

Fishing Passage

They're going fishing (because of the word bay).

Garden Party

They're going to a wedding or something special (because they're putting on their best clothes).

Strategy 7 - Confirming a Non-Immediate Prior Interpretation. Having made a particular interpretation, the reader then considers alternate interpretations but on the basis of subsequent information reverts to the earlier interpretation, confirming this interpretation as his choice.

Examples:

Skiing Passage

The student previously thought that Marty was going skiing for the first time, then after exposure to another episode of the passage, she states ("Now I know he's going skiing probably for the first time.").

Garden Party Passage

The student having already thought that snaps were pictures confirms after exposure to the word camera ("Now I'm sure snaps are pictures.")

Rodeo Passage

The student already surmised that Marty might be going to a fair or rodeo but later constrains his thoughts and confirms ("It's a rodeo, I know it's a rodeo now cause of the calf roping, steer wrestling and bronc riding.")

Strategy 8 - Assuming a Default Interpretation and Transforming Information. The reader makes a particular assumption based on incorrect knowledge. That is, the reader may lack prior knowledge associations for the data presented or he misconstrues new data presented in an attempt to confirm a previous interpretation in spite of inconsistencies.

Examples:

Fishing Passage

(They're going to the bay to go shopping.) In response to Question D_1, "Why did they tie up to the wharf?" the student says ("So they wouldn't lose their fish.").

Farming Passage

(A hopper is a machine that cuts grain.)

Randying Passage

Maybe after the fastest run he'll go home. The text then says nothing about his going home, however, after the student reads it she says ("He walked home and was glad he was safe.").

Strategy 9 - Neglecting to Respond or Holding Information. The reader has no interpretation of the information available, which is signified by silence, the expressions, "I don't know," "no," or the reader makes an interpretation and rephrases this same interpretation in two or more variations without the addition of any new information.

Examples:

Farming Passage

In response to Question D_1. "Why did he tie the tarp over the grain box?" the student responds ("I don't know.").

Oftentimes questions were asked and no response was given. This strategy was utilized on all six passages. Other students chose to reiterate a previous interpretation such as on the Rodeo Passage.

> He's getting up in the morning and like he's looking for his favorite jeans, (well he's looking for his jeans) and then his dad shouted he was about to leave, (like if you want to come, come now) (because I'm leaving), (so if you want to come, come now).

Strategy 10 - Empathizing from Experience. The reader on the basis of the data and his own personal experiences projects himself into the actual situation and experiences another's condition or state which becomes a part of his interpretation.

Examples:

Rodeo Passage

> They are at a rodeo and (I don't want the cows to get hurt because I don't like calf roping).

Skiing Passage

> He's scared because it's his first time skiing, (I was sure scared the first time I went).
>
> In response to Question E_2. "Do you think that he felt good that he didn't crash into the lineup? Why?" the student responds "Yeah, I don't know because like ah, (if he did, like 'Oh God, Help Me,' like this is all my new stuff and I don't want to bend any of it or something and like he could have hurt somebody else and it wouldn't make a good run down the hill, like because he would have gone down the hill

perfectly and then he comes crashing into the people in the lineup and then like they'd say 'Hey, get out of here, what are you doing?' and he'd just feel stupid)."

Method of Presentation

Each passage was written so that there were five goal structures (A, B, C, D, E) and a resolution (F) and the subjects were asked to introspect as to what they were thinking after they had read each goal structure. This procedure was justified on the basis of previous reseach. Olshavsky (1975) identified readers' response strategies and had readers stop at a red dot (which was placed at the end of each independent clause), at which time the subjects were to discuss what they were thinking. It was pointed out that oftentimes the readers merely gave a restatement of what they just read rather than what they were actually doing and why. McLeod (1978) asked specific inference questions as well as asking "Why do you think so?" and "What makes you think that?" questions. Since specific questions could possibly bias the reader, in that readers who would not ordinarily consider these questions while reading would now be forced to do so, the present investigator decided that specific questions were to be asked in this study only in instances where the subject did not make inferences freely during the introspection of the passages. Support for a combined introspection and probing where necessary were also supported by Baker and Stein (1981:11) who state that "by using a variety of test procedures, we can hope to obtain a reasonably accurate idea of what the reader has taken away from his or

her interaction with a text."

Asking the questions paralleled the manner in which the passages were presented. This means that the student introspected and, if necessary, was asked the corresponding inference and probe questions after each passage episode. Support for this technique was based on the research of Frase (1968:7), who found that asking a question after each paragraph (in this case each episode) is superior to asking all the questions at the end of the passage.

Dependent, Independent, and Control Variables

Dependent Variables

The following dependent variables have been identified for this study and are defined as follows.

Nature of Inferencing Strategy. This refers to each strategy and the number of times it was used. Ten inference strategies (N = 10) were identified as being employed by the grade six students of this study. The number of times that a student employed a particular strategy was counted and that raw score was the total of times that strategy was used. For example, student X may have used strategy one (STRAT 01) six times, strategy two (STRAT 02) four times, strategy three (STRAT 03) zero times . . .. These raw scores then become the number of times student X used each strategy.

Total Number of Inference Strategies (OTS). The overall total number of inference strategies was the summation of scores for each of the ten strategies which may be represented as (STRAT 01 +

STRAT 02 + STRAT 03 + STRAT . . . + STRAT 10) = OTS (overall total strategies used).

Source of Inference. The students' support statements for each inference were analyzed according to the number of key concepts used. Each key concept was then analyzed according to the origin of the information. When more of these concepts came from beyond the text, the source was identified as extralinguistic (IEXLING); otherwise, the source was linguistic (ILING). The source of the inference was expressed in terms of the proportion of information (PI) that was extralinguistic which may be represented as PIEXLING = IEXLING/(ILING + IEXLING). For example, a student who made forty-one inferences with fifteen extralinguistically based, would have a proportion score of 15/(26 + 15) x 100 = 37 percent for extralinguistically based inferences. Proportions allowed the researcher to view the performance of all the students equivalently in terms of their information source irrespective of the number of inferences they made.

Proportion of Extralinguistic Elaboration (PELABEXT). The degree to which a student expanded on the reasons for making a particular inference were defined in terms of the number of key concepts used in their elaboration. The proportion of the extralinguistic key concepts (PELABEXT) may be represented as follows: PELABEXT = ELABEXT/(ELABIT + ELABEXT). Consider the student who used a total of 249 key concepts (Elaboration) with 133 of these extralinguistically based; then the proportion of elaborations

which were extralinguistic would be a score of 133/(116 + 133) x 100 = 53 percent for that student. This differs from source in that source indicated where data for the majority of inferences came from, whereas extralinguistic elaboration refers to the degree to which the information for each inference was expanded on or explained.

Location of Main Inference (LOC). Since each subject read three passages (each with a main inference), the scores for making (or not making) an inference could range from 0-3. No students failed to make an inference early so a zero score was not necessary. An inference was made EARLY if it came prior to the third goal structure and LATE if it occurred after that point. Thus, if a student made all three inferences early, he was assigned a score of 3; for two inferences, a score of 2 and for one inference, a score of 1.

Independent Variables

The following independent variables were identified and are defined as follows.

Background Knowledge (BK). The study sample of forty students was divided into two equal groups and assigned to either familiar or unfamiliar passages. Those who read the familiar passages were referred to as the Background Knowledge plus group (BK+), while those who were assigned the unfamiliar passages were referred to as the Background Knowledge minus group (BK-).

Reading Proficiency. The study sample of forty students was divided into two equal groups categorized as Very Proficient and Less Proficient readers. The instrument used to categorize the two groups on the basis of reading proficiency in Vocabulary and Comprehension was the Canadian Tests of Basic Skills. Those subjects who attained a vocabulary and comprehension score below the fiftieth percentile were classified as Less Proficient Readers which means that the maximum grade equivalent for students in that group was 5.8 at the end of grade five. Those subjects who attained a vocabulary and comprehension score above the eighty-fifth percentile were classified as Very Proficient Readers which means that the minimum grade equivalent for anyone in that group was 7.0 at the end of grade five.

The technical manual for the Canadian Tests of Basic Skills reports a split-half reliability of 0.89 for the vocabulary subtest and a split-half reliability of 0.93 for the reading comprehension subtest. In a review of the Canadian Tests of Basic Skills Birch (in Buros, 1972:6) stated "It is reassuring to be able to use a test like the CTBS for it has a long line of respected antecedents so that its status need never be in doubt. It is in fact, simply a Canadian version of the well-known Iowa Test of Basic Skills."

Control Variables

Intellectual Ability. The subjects for this study fell within the average range of intellectual ability on the Canadian Lorge-Thorndike Intelligence Tests. Those students who scored an I.Q. equivalent score greater than 83 and less than 113 on the nonverbal

battery were selected. Odd-even reliability data for the tests, based on representative single-grade samples from the standardization program, range from 0.89 to 0.93 for different grades. The nonverbal scores were selected because they yield an estimate of scholastic aptitude not directly dependent upon ability to read.

Sex. Each group and subgroup within the study was made up of equal numbers of boys and girls.

Pilot Studies

Pilot Study One: The General Feasibility of the Inference Passages and Questions

The purposes for Pilot Study One were:

1. To determine the suitability of the passages.

2. To determine whether the questioning techniques (i.e., inference and probe questions) were supplying the information being sought.

3. To determine whether the timing of the questions was the most efficacious in terms of following the students' thinking.

4. To obtain samples of students' protocols in an attempt to identify the strategies being employed by the readers.

5. To further develop and refine the procedures used in the introspective interview technique.

Eight randomly selected grade six students in two schools not involved in the main study comprised the sample for this pilot. The students, four boys and four girls, were chosen according to the sample selection criteria. These students were grouped into a BK+ and

a BK- category according to their level of reading proficiency, such that two students comprised each cell under study. The investigator wrote eight inference passages (four familiar and four unfamiliar) and these passages were written with five goal structures designated as Episodes A, B, C, D, and E. The passages were compiled into booklets, one booklet for the familiar (BK+) passages and one booklet for the unfamiliar (BK-) passages. In addition, the passages were presented in the booklets by episode, in other words, each page of the booklet contained just one episode of a story.

Each student was to read aloud the episode of the story and then asked to introspect as to what he thought was happening. When the students finished their introspective comments if there were any inference questions left unanswered then they were asked by the investigator. If neither the student nor the investigator had any further questions or comments, then the student went on to the next episode of the passage, following the same procedures as in the preceding episode. The entire session with each student was tape recorded and later transcribed.

On the basis of pilot study one, the following decisions were made.

1. Two passages were dropped (one from the BK+ and one from the BK-) as all students indicated they were not challenging and consequently provided the least information relative to the other six passages. (Copies of these passages may be found in Appendix D.)

2. The questioning techniques were adequate for the most part but in some instances more clarification was necessary in order

to be certain of what the student was thinking and why. Thus, it was decided to probe more in some instances.

3. In the pilot, if students changed their minds part way through a passage, the investigator waited and asked why they did so at the end of the entire passage. It was found that when questioned at that point, usually the students had forgotten as to why they changed their minds, so it was decided to ask the questions immediately when such instances arose. This technique allowed the investigator to follow the subjects' thinking more closely.

4. The strategies as identified by Collins et al. (1977) on adults were found to be inadequate as they did not account for all the strategies the children were using. The investigator carefully examined the protocols of each of the students and tentatively identified ten strategies which seemed to characterize the strategies the children were using (see pp. 95-102 for definitions).

5. The procedures used in the introspective interview technique were feasible with the grade six students, and the students expressed an interest and pleasure in being participants.

In addition to the actual stated purposes for the pilot, the following modifications materialized indirectly:

6. Some students occasionally lost focus so it was decided that the main inference would be highlighted in the instructions preceding each passage. This main inference focus according to Frase (1968:7) would "provide a focus to the reader thus forcing the subjects to process relevant aspects of the text in 'useful ways.'"

7. It was decided that if students made oral reading

miscues that the investigator would reread the "correct" version of the word(s) to the student; otherwise it could lead to the student making incorrect assumptions. For example, TEXT: But there was room for lots more. STUDENT: But there was no room for more.

8. It was decided that another episode be added to each of the passages. Even after having read and discussed some of the passages the students were still not able to make the main inference. The addition of an Episode F to each of the passages provided a sense of "completeness" for the students since it made specific the main inference for those who had not already made this inference and allowed the others to confirm what they had already inferred.

Pilot Study Two: The Examination of the Modifications of the Inference Passages and Questions

Eight randomly selected grade six students, four boys and four girls, were chosen according to the selection criteria and grouped into the four cells of the study as previously discussed. The purposes of the second pilot study were:

1. To examine the modifications to the inference passages and questions in terms of the information acquired and to examine whether the techniques used in their administration were viable.

2. To obtain additional samples of the students' protocols to ascertain the feasibility of the strategies tentatively established after pilot study one.

The results of the pilot study indicated that:

1. The modifications to the inference passages and questions indeed refined the whole information gathering instruments. The

administration techniques worked well.

2. The tentative strategies identified as a result of pilot study one were exemplified by the students in their reading and appeared to provide an effective assessment of how grade six students cope with the text and their background knowledge in an inference situation.

Data Collection and Coding

Data Collection

The collection of the data extended over a three week period from January 12 to January 30, 1981. The investigator collected all the data from each student.

The basic structure of the data collection included the following:

1. Prior to visiting each school, the investigator asked that a small room relatively free from noise be available for working with the students as the entire sessions were tape recorded. This request was always most cooperatively granted.

2. The selected students from each school first met as a group at which time they were told the purpose of the study. The general procedures were then outlined to the group and a sample passage was presented and worked through. (Copy of same in Appendix E.) Upon completion of the trial run, the investigator immediately clarified any misunderstandings which may have arisen and answered any questions posed by the students. The students were instructed that the investigator would meet with each of them individually

during scheduled school hours for approximately one-half hour. Finally, the investigator asked who would like to participate in the study. Only those volunteering to participate were included in the study.

3. One student remained with the investigator and both sat at a table with a tape recorder between them. The investigator again inquired whether the student understood the procedure. Each student was then given the following instructions:

> I would like you to read three stories for me. Each story is divided into six parts. This little booklet (illustrating it to the student) contains the three stories and each story is separated by this yellow divider (illustrating it to the student). I want you to stop after each episode (page) and tell me what you are thinking and why.

The investigator then zeroed in on the main inference for that particular story. For example, on the Rodeo Passage, the subject was told:

> This story is about two people going somewhere. I want you to think about what is happening and where they are going, as soon as you think you know, I want you to tell me.

The student then read Episode A and introspected as to his thoughts. If the student did not answer any or all of the inference questions freely, then the investigator asked these to the student, oftentimes accompanied by probe questions. If no further questions were necessary on Episode A, then the student was instructed to continue reading the passage (Episode B, etc.). The same procedures were followed through to Episode F and for all three passages, the only variation being the main inference for the other stories.

4. As each child completed the reading and discussion of each of the three passages, they were thanked for their cooperation

in the study and asked to notify the next student that it was his turn. The same procedures were followed for all forty students. Each session was approximately one-half hour in length.

Coding of the Collected Data

Once the data were transcribed, the first task was to identify and number the inferences made by each student. The researcher studied each protocol in conjunction with the text (inference passages) and the inference questions while bearing in mind the definition of an inference. If the student generated information which was previously unstated explicitly by the author on the basis of and within the constraints of the text, then it was identified as an inference. The first inference was assigned a one, the second inference was assigned a two and the last number assigned was contingent upon how many inferences that student made. A sample of a numbered protocol is given in Appendix F.

The second task of the coding involved the inspection of the students' protocols and the identification of the point (Early or Late) at which the students made the main inference. If the student made the main inference after goal structures one or two, then it was classified as an early inference; if the student made the main inference after goal structures three or subsequent goal structures then it was classified as a late inference.

The third task in the data coding process involved the division of the students' protocols into idea units. An idea unit was defined as a proposition containing at least one relational concept and at least one argument. A relational concept was

represented as the surface structure units designated as verb, adjective, adverb, and sentence connectives. An argument was defined as fulfilling different semantic functions designated as agent (investigator of an action); object (object of action which undergoes change) (movement); goal (the goal or result of an action). In instances where inferential questions were posed, both the relational concept(s) and an argument(s) may have been provided by the question rather than being stated explicitly in the students' responses. Therefore, the ensuing response may have contained only one word. Thus the response was identified as either an argument or a relational concept with the propositional structure being understood. A sample protocol divided into idea units is given in Appendix G.

Task four followed on the completion of the third task. The idea unit served as the information measure which was equated with a particular inference strategy. Each student's protocol was studied per passage to first acquire a "feeling" for how the student's thinking progressed throughout the passage. The investigator then methodically assigned an inference strategy to each idea unit. Upon completion of the assignment of the strategies to the idea units, the investigator tallied the number of times each strategy was used across all three passages read by each student. Three further points need to be made regarding the coding or classifying of the inference strategies. First, strategy four entitled "Analysing Alternatives" sometimes transcended more than one idea unit. It was a strategy used to indicate tentativeness in one's thinking. For example, question E_2 on the Skiing Passage asked "Do you think that he (Marty) felt good

that he didn't crash into the lineup? Why?" a student responded: "/Yes,/ he might have hurt some people by skiing into them/ and they could fall on the ski tips and cut themselves/ or even knock out an eye./" The preceding example illustrates that this strategy may on occasion, go beyond one idea unit in order to legitimately deal with the student's thinking process. Secondly, strategy ten identified as "Empathizing from Experience" also invariably involved the combination of several idea units. For example, question C, on the Rodeo Passage asked "Why did Marty think his father would not want to stop by Billy's house?" a student responded:

> /Maybe it was because he didn't have much time/ but really it may have been because he didn't like Billy's dad./ My dad is not too keen on some of my friends' dads either you know./

As demonstrated by this example, the student's thoughts were all directed toward the relation of the text with his own ideas and all were developed toward a common end, "Why Marty's dad may not have wanted to stop." Thirdly, one idea unit periodically was classified as involving two strategies. One of these two strategies was most often strategy four "Analysing Alternatives" which was used to indicate tentativeness in one's thinking. In instances where a single idea unit was assigned two strategies, the student may have been confirming a previous interpretation while also being tentative about his interpretation. For example, question B_2 on the Farming Passage asked "Why was it important for them to get the crop off?" a student responded, "/It's probably late in the season/ and it's time to harvest it./" This example may be classified as embodying strategies four and six because the student has already discussed the farmers'

cutting the grain, why it's hard to cut, and when asked question B_2 is confirming her interpretation, yet is tentative as evidenced by the use of the word "probably," thus justifying the assignment of two strategies to one idea unit. Appendix H provides a sample of the assigned strategies.

The fifth task in the coding of the research data concerned the identification of key concepts in the protocols of each student. Key concepts, as defined under Source of Inference in Chapter I, comprised nouns, verbs, adjectives, and adverbs, and sometimes prepositions, if they designated place which was important in arriving at the inference. The key concepts were underlined and the investigator then bracketed those key concepts which were extralinguistically based (see Appendix I for a sample).

Task five served two main facets of the study. The number of key concepts were first used to measure a student's inference elaboration which refers to the degree to which a student expanded on each inference made. The amount of elaboration was defined in terms of the number of key concepts used in the student's reasoning. Since each elaboration was made up of information from both the text (linguistic) and background knowledge (extralinguistic) sources, a raw count of the number of times each key concept came from either source was tallied. It should be pointed out that repetitions, questions on the part of the student, and mazes were not considered as key concepts in this study as they were neither a source nor an elaboration of the inferences under study.

Using the information from the coded inference elaboration,

the investigator judged whether the main source for each inference was extralinguistic or linguistic. For example, for student X on inference one, the key concepts for that inference were identified, then the key concepts used to elaborate the inference were coded as to whether they were linguistically based or extralinguistically based. That subject (X) made 18 elaborations (8 linguistically based and 10 extralinguistically based). Since more than half of the key concepts came from beyond the text, it was established that the main source of information used by subject X in the generation of inference one was extralinguistically based.

Inter-rater Reliability. The researcher maintained contact with her thesis Supervisor as each step of the coding unfolded. A minimum of one-tenth of all the protocols were analyzed by him on every aspect of the study to ensure the reliability of the coding. The percentages of the inter-rater reliability on each aspect are presented in Table 3.

Research Design and Statistical Analysis

The Research Design

The forty students comprising the subjects for this study were divided into four equal groups which are represented as in Figure 7. This means that the forty students constituted two groups of readers, twenty designated as Very Proficient and twenty designated as Less Proficient. In addition, these two groups of readers were further divided into ten Very Proficient readers categorized as Background Knowledge Plus; ten Very Proficient readers designated as Background

Table 3

Inter-rater Reliabilities for Variable Coding

Analysis	Percentage of Agreement
Identification and number of inferences	100
Location of main inference early or late	100
Identification of idea units	96.3
Assignment of inference strategies	93.4
Identification of key concepts	100
Inference elaboration	96.3
Source of inference	98.6

	Reading Proficiency	
	VP	LP
BK+	10	10
BK-	10	10

Figure 7

Illustration of Study Design

Knowledge Minus; ten Less Proficient readers categorized as Background Knowledge Plus; and finally, ten Less Proficient readers categorized as Background Knowledge Minus. Each of these four classifications was made up of equal numbers of males and females.

To ensure that the intelligence level of each of the groups Very Proficient and Less Proficient Readers was comparable, a series of t-tests were computed to establish whether or not differences between the samples were statistically significant. Additional t-tests were computed for vocabulary and comprehension to ascertain whether or not statistically significant differences in these abilities existed for each of the classification groups (BK+, BK-) and according to their levels of reading proficiency. The results revealed no statistical differences between the groups according to intellectual ability. The overall mean on I.Q. for all forty students was 107.7 with a maximum deviation of +1.4 and a minimum deviation of -1.2. The results revealed no statistical differences between the Less Proficient readers grouped as Background Knowledge Plus and Background Knowledge Minus according to their vocabulary ability, and no statistical differences for the same group according to their comprehension ability. No statistical differences were found between the Very Proficient readers grouped according to Background Knowledge Plus and Background Knowledge Minus on their vocabulary ability and on their comprehension ability. The results of these findings are summarized in Table 4.

Table 4

Sample Description: Means, t-Tests and Standard Deviations for Criterion Variables

		IQ		Vocabulary		Comprehension	
Reading Proficiency	Group	Mean	SD	Mean	SD	Mean	SD
Less Proficient (n = 20)	BK+	108.6	(4.84)	40.5	(11.65)	39.5	(12.79)
	BK-	106.7	(4.42)	48.0	(10.06)	45.5	(9.26)
	t-test	ns		ns		ns	
Very Proficient (n = 20)	BK+	109.1	(3.95)	92.3	(4.52)	91.8	(5.05)
	BK-	106.5	(4.81)	92.2	(5.96)	92.9	(4.04)
	t-test	ns		ns		ns	

The Statistical Analysis of the Data

The method of statistical analysis is presented in relation to each identified hypothesis.

Two-Way Analysis of Variance. Hypotheses 1a, 1b, and 2 were tested with the total number of inference strategies as the dependent variable and with the independent variables being background knowledge and reading proficiency as represented in Figure 8.

Hypotheses 3a, 3b, and 4 were tested using a two-way analysis of variance design. Ten discrete two-way analyses of variance were run to test these hypotheses since the dependent variable, nature of the inference strategies, involved ten strategies (total of each strategy). The independent variables were background knowledge and reading proficiency. This analysis is represented as in Figure 9.

The dependent variable in the test of Hypothesis 5a was the proportion of the information source that was extralinguistic in the generation of inferences. The dependent variable in the test of Hypothesis 5b was the proportion of the inference elaborations that was extralinguistic. Both Hypotheses 5a and 5b had the same independent variables, background knowledge and reading proficiency. The two-way analysis of variance was used in both hypotheses. Figure 10 represents the variables considered in Hypothesis 5a and Figure 11 represents Hypothesis 5b.

Hypotheses 6a and 6b were tested using the two-way analysis of variance design. The dependent variable was the location (Early or Late) of the main inference and the independent variables were background knowledge and reading proficiency as represented in Figure 12.

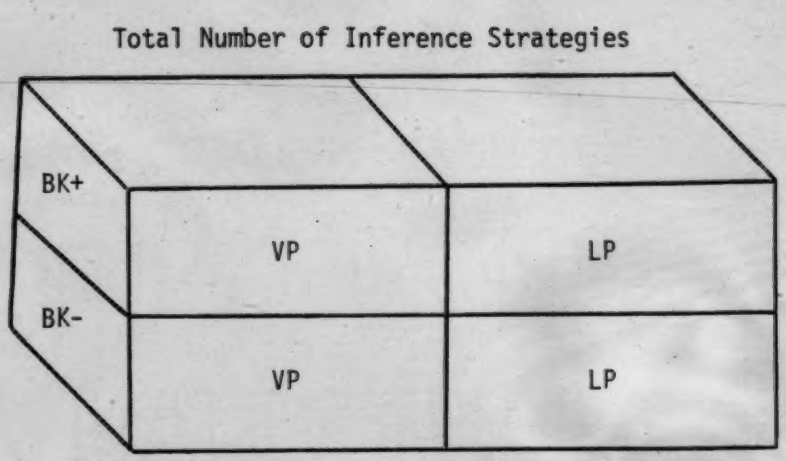
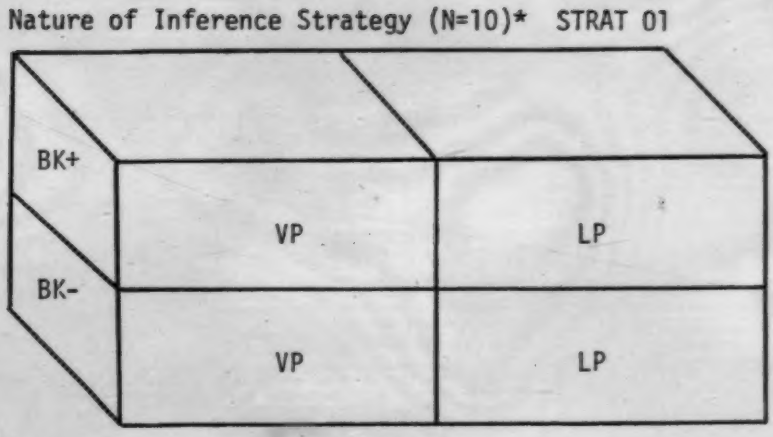


Figure 8

Two-Way Analysis of Variance Illustration
for Hypotheses 1a, 1b, 2



*This design was used to test all ten strategies thus ten two-way analyses of variance were computed.

Figure 9

Two-Way Analysis of Variance Illustration
for Hypotheses 3a, 3b, 4

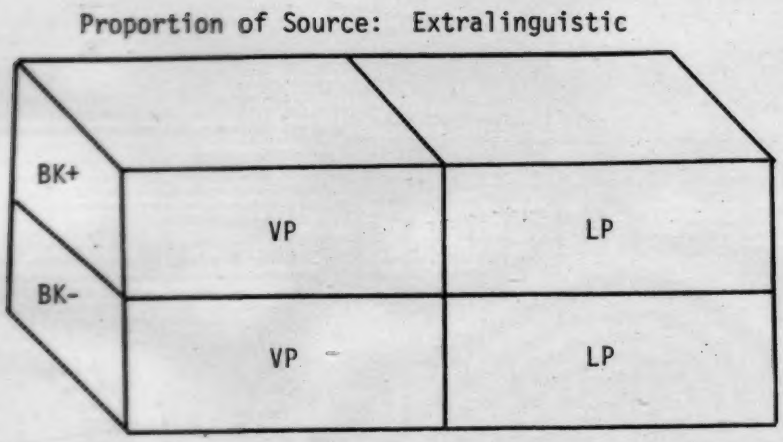


Figure 10

Two-Way Analysis of Variance Illustration
for Hypothesis 5a

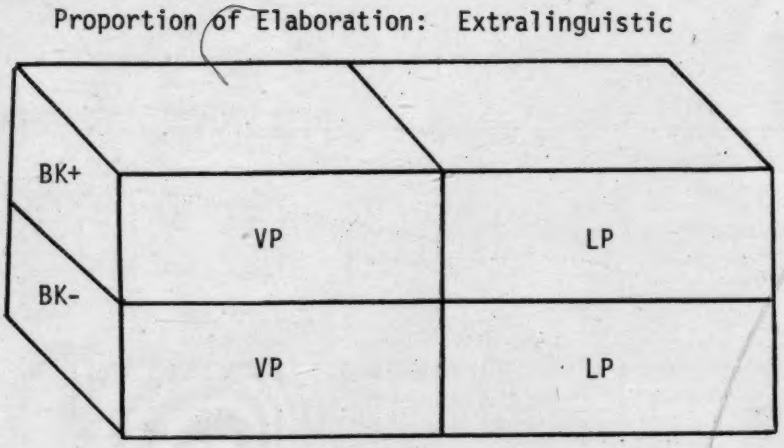


Figure 11

Two-Way Analysis of Variance Illustration
for Hypothesis 5b

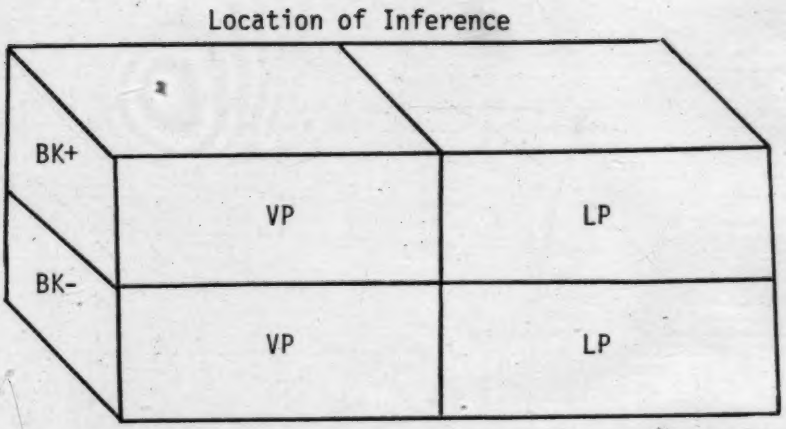


Figure 12

Two-Way Analysis of Variance Illustration
for Hypotheses 6a and 6b

Analysis of Covariance. The dependent variable in the test of Hypothesis 7a was the proportion of extralinguistic information used in the inference process. The independent variables were background knowledge, reading proficiency, and the covariates were strategies 04, 06, 09, and 10*. The dependent variable in the test of Hypothesis 7b was the location of the main inference (Early or Late) and the independent variables were background knowledge, reading proficiency, and the covariates were strategies 09 and 10*. Figure 13 represents both Hypotheses 7a and 7b.

Hypothesis 8 was also tested using an analysis of covariance. The dependent variable was the location of the main inference and the independent variables were background knowledge, reading proficiency, and the covariates were inference strategies 09 and 10 and the proportion of extralinguistic information as represented by Figure 14.

Factor Analysis. The reasons for conducting a factor analysis of the ten inference strategies are as follows:

1. To ascertain whether the strategies were, in fact, independent factors or whether they were components of a scale which might be referred to as a general or overall inferencing strategy. Inspection of the zero-order correlation matrix of the ten strategies indicated that they were relatively independent of one another because most of the correlations were quite low (e.g., less than .20, $p \leq .10$) (see Table 5).

2. If a scale could be constructed it was necessary to find out whether it was unidimensional or multidimensional. In fact, the

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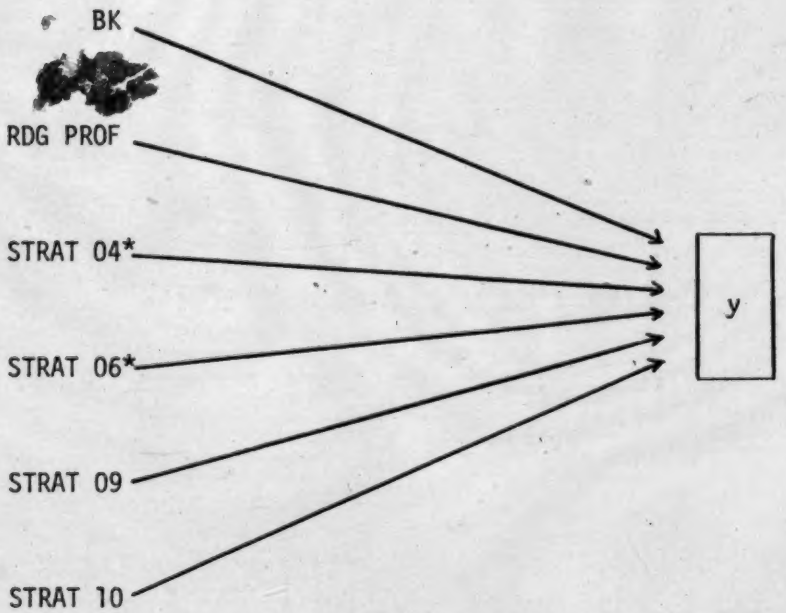
*These strategies were shown to be significantly correlated with the dependent variable of this hypothesis.



Key to Mnemonics:

y = Dependent Variable (H7a—Proportion of Extralinguistic Information)
(H7b—Location of Main Inference)

*Used only in the test of Hypothesis 7a.

Figure 13

Path Model of Analysis of Covariance Used to Test Hypothese 7a, 7b

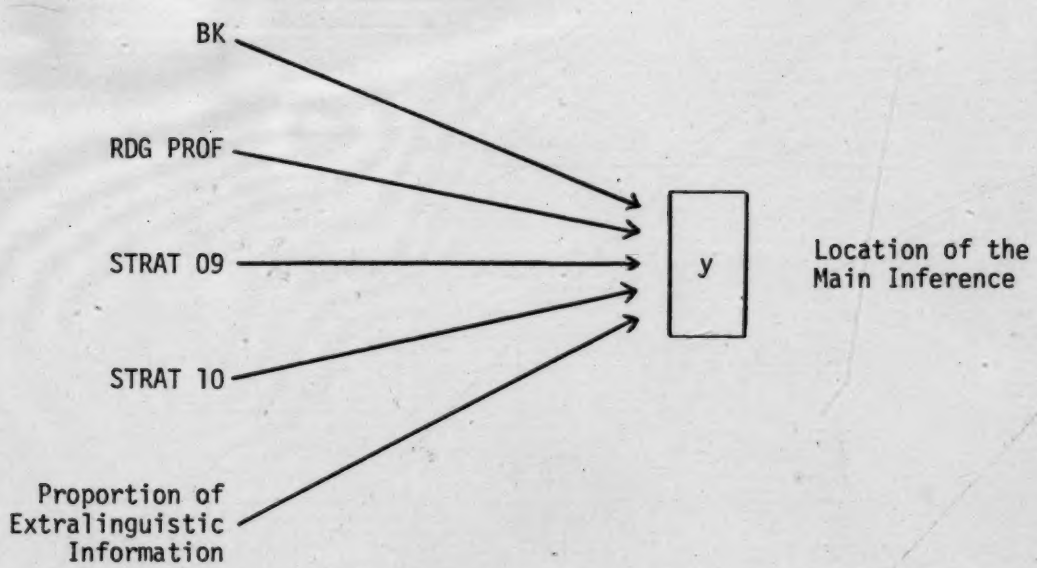


Figure 14

Path Model of Analysis of Covariance Used to Test Hypothesis 8

Table 5

Zero-Order Correlations, Means, and Standard Deviations of Inferencing Strategy Variables, Background Knowledge, and Reading Proficiency

Variables	TYPE	PROF	STRAT 01	STRAT 02	STRAT 03	STRAT 04	STRAT 05	STRAT 06	STRAT 07	STRAT 08	STRAT 09	STRAT 10	Means	SD
TYPE	1.000												1.500	.506
PROF	0.0	1.000											1.500	.506
STRAT 01	-.081	-.081	1.000										.725	.933
STRAT 02	-.142	-.028	.238	1.000									3.950	1.782
STRAT 03	-.012	-.319	-.031	-.140	1.000								3.300	4.128
STRAT 04	.016	.148	-.002	-.009	.314	1.000							28.100	12.326
STRAT 05	0.0	-.264	.035	.142	-.134	.163	1.000						4.100	3.257
STRAT 06	-.253	.422	.041	-.206	.376	.644	-.092	1.000					87.750	19.422
STRAT 07	-.137	-.159	.251	-.122	.129	.081	.321	-.073	1.000				3.150	4.445
STRAT 08	.375	-.236	.186	.202	-.467	-.006	-.029	-.372	-.166	1.000			12.725	6.947
STRAT 09	.189	-.414	-.011	.172	-.118	.036	.028	-.269	.040	.242	1.000		17.250	5.633
STRAT 10	-.285	.384	-.056	-.119	.222	.223	-.113	.390	.072	-.373	-.260	1.000	1.075	2.043
OTS	-.045	.184	.125	-.019	.380	.911	.166	.791	.165	-.055	.096	.277	163.375	30.383

Note: The underlined coefficients were statistically significant at the $p \leq .10$ level.

The Key to the Mnemonics:

TYPE = Passges BK+, BK-
PROF = Reading Proficiency
STRAT 01 = Strategy 1
STRAT 02 = Strategy 2
⋮
STRAT 10 = Strategy 10
OTS = Overall Total Inferencing Strategies

pattern of factor loadings clearly indicated that most strategies loaded highly on only one factor (see Table 6). This meant that the strategies were relatively independent of one another; that is, were orthogonal. On the basis of these results one may conclude that the inferencing strategies were independent entities or factors. The correlation coefficients of the strategy variables were low (see Table 7).

Pearson Product-Moment Correlations. The first Pearson correlation run was used to identify which of the inferencing strategies (N = 10) were significantly related to the dependent variables in Hypotheses 7a and 7b. This statistic was computed in an attempt to reduce the number of variables as the case base (N = 40) was insufficient to perform the appropriate statistics. The result of the Pearson correlations identified Strategies 04, 06, 09, and 10 as the inferencing strategies to be considered in the analysis of covariance used to test Hypothesis 7a while only 09 and 10 were identified in the test of Hypothesis 7b (see Table 8).

The second Pearson product-moment correlation was computed to select the inferencing strategies (N = 10) for inclusion in the testing of Hypothesis 8. The two strategies identified were 09 and 10 (see Table 8). The final Pearson correlation run provides a master matrix which presents the correlation coefficients, the number of cases upon which they are based, and the level of statistical significance for each variable in the study (see Appendix J).

Other Statistics. Descriptive statistics were computed for appropriate variables in the study. These statistics are discussed as they occur in the presentation of the findings.

Table 6

Inferencing Strategy Factors: Factor Matrix from Orthogonal Rotation (Varimax) with Eigenvalues and Communalities

Variable	FAC 1	FAC 2	FAC 3	FAC 4	FAC 5	FAC 6	FAC 7	FAC 8	FAC 9	FAC 10	Eigen	Communalities
STRAT 01	.000	-.018	-.023	.089	.124	.002	-.008	.978*	.136	.030	2.591	1.000
STRAT 02	-.011	.082	-.039	.073	.977*	.076	-.050	.125	-.074	-.056	1.518	1.000
STRAT 03	.181	-.039	.075	-.226	-.054	-.084	.943*	-.007	.065	.073	1.276	1.000
STRAT 04	.967*	.042	.100	.051	.011	.102	.151	-.014	.042	.128	1.074	1.000
STRAT 05	.081	.003	-.062	-.026	.769	.974*	-.076	.002	.167	-.032	.947	1.000
STRAT 06	.564	-.164	.190	-.239	-.128	-.073	.150	.074	-.096	.709*	.897	1.000
STRAT 07	.022	.031	.037	-.077	-.077	.172	.062	.142	.964*	-.042	.721	1.000
STRAT 08	.019	.114	-.182	.925*	.084	-.033	-.241	.107	-.088	-.114	.489	1.000
STRAT 09	.013	.981*	-.118	.097	.081	.003	-.036	-.017	.030	-.070	.360	1.000
STRAT 10	.128	-.125	.960*	-.164	-.040	-.064	.073	-.024	.037	.086	.144	1.000

*Those correlations marked with an asterisk indicate which strategy loaded the most significantly with each factor.

Table 7

Correlation Coefficients, Means and Standard Deviations
for Inferencing Strategy Variables

Variables	STRAT 01	STRAT 02	STRAT 03	STRAT 04	STRAT 05	STRAT 06	STRAT 07	STRAT 08	STRAT 09	STRAT 10	Means	SD
STRAT 01	1.000										.725	.933
STRAT 02	.238	1.000									3.950	1.782
STRAT 03	-.031	-.141	1.000								3.300	4.127
STRAT 04	-.002	-.009	.314	1.000							28.100	12.326
STRAT 05	.035	.142	-.134	.163	1.000						4.100	3.257
STRAT 06	.041	-.206	.376	.644	-.092	1.000					87.750	19.422
STRAT 07	.251	-.122	.129	.081	.321	-.073	1.000				3.150	4.447
STRAT 08	.186	.202	-.467	-.006	-.029	-.372	-.166	1.000			12.725	6.947
STRAT 09	-.011	.172	-.108	.035	.028	-.269	.040	.242	1.000		17.250	5.633
STRAT 10	-.056	-.119	.222	.223	-.113	.390	.072	-.373	-.260	1.000	1.075	2.043

Table 8

Correlation Coefficients, Means, and Standard Deviations of Inferencing Strategy Variables, Background Knowledge, Reading Proficiency and Proportion of Extralinguistic Information Source

Variables	TYPE	PROF	STRAT 01	STRAT 02	STRAT 03	STRAT 04	STRAT 05	STRAT 06	STRAT 07	STRAT 08	STRAT 09	STRAT 10	PIEXLING	LOC	Means	SD
TYPE	1.000														1.500	.506
PROF	0.0	1.000													1.500	.506
STRAT 01	-.081	-.081	1.000												.725	.933
STRAT 02	-.142	-.028	.238	1.000											3.950	1.782
STRAT 03	-.012	.319	-.313	-.141	1.000										3.300	4.128
STRAT 04	.016	.148	-.002	-.009	.314	1.000									28.100	12.326
STRAT 05	.000	-.264	.035	.142	-.134	.163	1.000								4.100	3.257
STRAT 06	-.253	.422	.041	-.206	.376	.644	-.092	1.000							87.750	19.422
STRAT 07	-.137	-.159	.251	-.122	.129	.081	.321	-.073	1.000						3.150	4.445
STRAT 08	.375	-.237	.186	.202	-.467	-.006	-.029	-.372	-.166	1.000					12.725	6.947
STRAT 09	.189	-.414	-.011	.172	-.108	.036	.028	-.269	.040	.242	1.000				17.250	5.633
STRAT 10	-.285	.384	-.056	-.119	.223	.223	-.113	.390	.072	-.373	-.260	1.000			1.075	2.043
PIEXLING	-.223	.235	.045	.002	.094	.467	.107	.636	.143	-.648	-.353	.456	1.000		.483	.092
LOC	-.160	.267	-.033	-.171	-.132	-.056	-.028	.102	.085	-.160	-.593	.290	.200	1.000	1.675	.474

Note: The underlined coefficients were statistically significant at the $p \leq .10$ level.

The Key to the Mnemonics:

TYPE = Passages BK+, BK-
PROF = Reading Proficiency
STRAT 01 = Strategy 1
:
:
STRAT 10 = Strategy 10
PIEXLING = Proportion of Extralinguistic Information Sources
LOC = Location of Main Inference

The computer program used in this study was the Statistical Package for the Social Sciences (SPSS). The statistical analyses were funded by the Department of Elementary Education and computer facilities were provided by the Division of Educational Research Services at the University of Alberta.

Criterion of Statistical Significance. Due to the amount of coding and the time constraints on the present study, the case base was minimized to forty and the level of statistical significance adopted was at the .10 level. Since t-tests and F-ratios are very sensitive to sample size, in all likelihood if the case base were increased then the findings would be statistically significant at the .05 level simply because of the increase in sample size. It was also felt that since this study was testing a newly constructed theory, the level of significance could be more lenient to help detect differences and suggest trends. In instances where the findings are statistically significant at or beyond the .05 level the actual levels are stated.

Summary

This chapter on the research design discusses the sample selection of forty students, and the control, independent and dependent variables. Information was also presented on the pilot studies, the collection, coding and analysis of the data.

Chapter V will present the findings and a discussion from the statistical analysis of Hypotheses 1 to 4 dealing specifically with the inferencing strategies. The results of Hypotheses 5 to 8 will be discussed in Chapter VI.

Chapter V

FINDINGS I: THE INFERENCING STRATEGIES

Introduction

The findings reported in this chapter deal specifically with the inferencing strategies identified in this study, the effects of background knowledge and level of reading proficiency, and the interaction effects of the two. The format for presentation includes a restatement of Hypotheses 1a, 1b, 2, 3a, 3b, and 4, as presented in Chapter I, followed by a statement of rejection or nonrejection, and accompanied by a discussion of the results. Tables and figures are provided where applicable to supplement the discussion of the findings.

Relationships between Background Knowledge, Reading Proficiency and the Inferencing Strategies

The inferencing strategies identified in this study constitute the main focus of the chapter, therefore the means and standard deviations for each of the inferencing strategies are presented in Table 9 to provide the reader with an overview prior to the presentation and discussion of each of the hypotheses. The reader may notice that there is quite a range across the various strategies used. Inferencing strategy 06 has been used the most frequently and inferencing strategy 01 has been used the least frequently of all ten inferencing strategies; one must be cognizant, however, that each

Table 9

Means and Standard Deviations for Each Inferencing Strategy (N = 10) According to Combined Groups, Background Knowledge, and Reading Proficiency

		STRAT 01	STRAT 02	STRAT 03	STRAT 04	STRAT 05	STRAT 06	STRAT 07	STRAT 08	STRAT 09	STRAT 10
Combined Groups	(N=40)	0.725	3.950	3.300	28.100	4.100	87.750	3.150	12.725	17.250	1.075
		(0.933)	(1.782)	(4.128)	(12.326)	(3.257)	(19.422)	(4.447)	(6.947)	(5.633)	(2.043)
Background Plus	(n=20)	0.800	4.200	3.350	27.900	4.100	92.600	3.750	10.150	16.200	1.650
		(1.056)	(1.936)	(4.404)	(12.506)	(3.076)	(22.213)	(5.730)	(6.115)	(6.420)	(2.720)
Background Minus	(n=20)	0.650	3.700	3.250	28.300	4.100	82.900	2.550	15.300	18.300	0.500
		(0.813)	(1.625)	(3.945)	(12.465)	(3.508)	(15.210)	(2.645)	(2.645)	(4.646)	(0.688)
Very Proficient	(n=20)	0.650	3.900	4.600	29.900	3.250	95.850	2.450	11.100	14.950	1.850
		(0.813)	(2.150)	(5.009)	(12.052)	(2.489)	(17.848)	(2.212)	(8.065)	(3.734)	(2.601)
Less Proficient	(n=20)	0.800	4.000	2.000	26.300	4.950	79.650	3.850	14.350	19.550	0.300
		(1.056)	(1.376)	(2.513)	(12.641)	(3.748)	(17.822)	(5.887)	(5.334)	(6.329)	(0.733)

Note: The mean is presented first and the standard deviation is presented in brackets below the mean.

strategy performs a distinct function for the subjects thus possibly regulating its use.

Hypothesis 1a

> That background knowledge will not be a factor in determining the total number of inference strategies used.

Since the effect of background knowledge was not statistically significant (see Table 10) the null hypothesis was not rejected.

Hypothesis 1b

> That reading proficiency will not be a factor in determining the total number of inference strategies used.

The impact of reading proficiency was not statistically significant at the .10 level of probability, therefore the null hypothesis was not rejected (see Table 10).

Hypothesis 2

> That there will be no interaction effects between background knowledge and reading proficiency as predictors of the total number of inference strategies used.

The interaction effects were not statistically significant and consequently the null hypothesis was not rejected (see Table 10).

Discussion of Findings on Hypotheses 1a, 1b and 2

No significant differences in the total number of inference strategies used were found on the basis of passage type (background plus or minus), reading proficiency, or the interaction of the two. It seems that the total number of inference strategies is not a discriminating feature in itself. This finding is indirectly supported by past research in that it has been shown that good and

Table 10

Effects of Background Knowledge, Reading Proficiency and their Interaction on Total Inference Strategies

Source of Variation	Sum of Squares	df	Mean Square	F	p
Main Effects	1296.650	2	648.325	.679	.513
Background Effect	75.625	1	75.625	.079	.780
Proficiency Effect	1221.025	1	1221.025	1.279	.266
Interaction Effect between Background and Proficiency	342.225	1	342.225	.359	.553
Residual	34364.434	36	954.567		
Total	36003.309	39	923.162		

poor readers can and do generate comparable numbers of inferences and predictions (Inglis, 1974; McLeod, 1978; and Schienbein, 1978) but may vary on other factors. In this study, both groups of readers used comparable total numbers of inferencing strategies on the two types of passages.

Hypothesis 3a

That background knowledge will not be a factor in determining the nature of the inference strategies (N = 10) used.

Since the effect of background knowledge was statistically significant for STRAT 06 ($p = .10$, see Table 11f), STRAT 08 ($p = .01$, see Table 11b), and STRAT 10 ($p = .05$, see Table 11j) then the null hypothesis was rejected for these three strategies; the null hypothesis was not rejected for the seven remaining inferencing strategies; STRAT 01, STRAT 02, STRAT 03, STRAT 04, STRAT 05, STRAT 07, and STRAT 09 as they were not statistically significant at the .10 level of probability.

Discussion

Those students reading the background knowledge plus passages used more of STRAT 06 and STRAT 10 than those reading the background knowledge minus passages. The pupils reading the familiar passages had a mean of 92.60 as compared to 82.90 for the pupils reading the unfamiliar passages in the use of STRAT 06. STRAT 06 is identified as "Confirming an Immediate Prior Interpretation" so it seems that those subjects reading the familiar passages were more competent in confirming their previous interpretations as they shared a degree of mutual knowledge with the text and were able to relate the two. This

Table 11

Results of the Test of the Nature of the Inferencing Strategies (N = 10)

Table 11a

Effects of Background Knowledge, Reading Proficiency and their Interaction on STRAT 01

Source of Variation	Sum of Squares	df	Mean Square	F	p
Main Effects	.450	2	.235	.257	NS
Background Effect	.225	1	.225	.257	NS
Proficiency Effect	.225	1	.225	.257	NS
Interaction Effect between Background and Proficiency	2.025	1	2.025	2.314	NS
Residual	31.500	36	.875		
Total	33.975	39	.871		

Table 11b

Effects of Background Knowledge, Reading Proficiency and their Interaction on STRAT 02

Source of Variation	Sum of Squares	df	Mean Square	F	p
Main Effects	2.600	2	1.300	.394	NS
Background Effect	2.500	1	2.500	.758	NS
Proficiency Effect	.100	1	.100	.030	NS
Interaction Effect between Background and Proficiency	2.500	1	2.500	.758	NS
Residual	118.800	36	3.300		
Total	123.900	39	3.177		

Table 11c

Effects of Background Knowledge, Reading Proficiency and their Interaction on STRAT 03

Source of Variation	Sum of Squares	df	Mean Square	F	p
Main Effects	67.700	2	33.850	2.174	NS
Background Effect	.100	1	.100	.006	NS
Proficiency Effect	67.600	1	67.600	4.341	.05
Interaction Effect between Background and Proficiency	36.100	1	36.100	2.318	NS
Residual	560.596	36	15.572		
Total	664.396	39	17.036		

Table 11d

Effects of Background Knowledge, Reading Proficiency and their Interaction on STRAT 04

Source of Variation	Sum of Squares	df	Mean Square	F	p
Main Effects	131.200	2	65.600	.424	NS
Background Effect	1.600	1	1.600	.010	NS
Proficiency Effect	129.600	1	129.600	.839	NS
Interaction Effect between Background and Proficiency	230.400	1	230.400	1.491	NS
Residual	5563.980	36	154.555		
Total	5925.582	39	151.938		

Table 11e

Effects of Background Knowledge, Reading Proficiency and their Interaction on STRAT 05

Source of Variation	Sum of Squares	df	Mean Square	F	p
Main Effects	28.900	2	14.450	1.527	NS
Background Effect	0.0	1	0.0	0.0	NS
Proficiency Effect	28.900	1	28.900	3.055	.10
Interaction Effect between Background and Proficiency	44.100	1	44.100	4.661	.05
Residual	340.599	36	9.461		
Total	413.599	39	10.605		

Table 11f

Effects of Background Knowledge, Reading Proficiency and their Interaction on STRAT 06

Source of Variation	Sum of Squares	df	Mean Square	F	p
Main Effects	3565.300	2	1782.650	5.763	.01
Background Effect	940.900	1	940.900	3.042	.10
Proficiency Effect	2624.400	1	2624.400	8.484	.01
Interaction Effect between Background and Proficiency	10.000	1	10.000	0.032	NS
Residual	11136.141	36	309.337		
Total	14711.441	39	377.216		

Table 11g

Effects of Background Knowledge, Reading Proficiency and their Interaction on STRAT 07

Source of Variation	Sum of Squares	df	Mean Square	F	p
Main Effects	34.000	2	17.000	.831	NS
Background Effect	14.400	1	14.400	.704	NS
Proficiency Effect	19.600	1	19.600	.958	NS
Interaction Effect between Background and Proficiency	.900	1	.900	.044	NS
Residual	736.197	36	20.450		
Total	771.097	39	19.772		

Table 11h

Effects of Background Knowledge, Reading Proficiency and their Interaction on STRAT 08

Source of Variation	Sum of Squares	df	Mean Square	F	p
Main Effects	370.850	2	185.425	5.084	.01
Background Effect	265.225	1	265.225	7.271	.01
Proficiency Effect	105.625	1	105.625	2.896	.10
Interaction Effect between Background and Proficiency	198.025	1	198.025	5.429	.05
Residual	1313.096	36	36.475		
Total	1881.971	39	48.256		

Table 11i

Effects of Background Knowledge, Reading Proficiency and their Interaction on STRAT 09

Source of Variation	Sum of Squares	df	Mean Square	F	p
Main Effects	255.700	2	127.850	4.696	NS
Background Effect	44.100	1	44.100	1.620	NS
Proficiency Effect	211.600	1	211.600	7.771	.01
Interaction Effect between Background and Proficiency	1.600	1	1.600	.059	NS
Residual	980.198	36	27.228		
Total	1237.498	39	31.731		

Table 11j

Effects of Background Knowledge, Reading Proficiency and their Interaction on STRAT 10

Source of Variation	Sum of Squares	df	Mean Square	F	p
Main Effects	37.250	2	18.625	5.755	.01
Background Effect	13.225	1	13.225	4.087	.05
Proficiency Effect	24.025	1	24.025	7.424	.01
Interaction Effect between Background and Proficiency	9.025	1	9.025	2.789	NS
Residual	116.500	36	3.236		
Total	162.775	39	4.174		

finding seems to be related to the work of Gordon et al. (1979) in terms of schema theory in that once the pupils identified the appropriate schema then it became a matter of integrating the information in the text into that schema.

"Empathizing from Experience," STRAT 10 was used a mean number of 1.65 times by the familiar readers as compared to a mean of .50 for the unfamiliar readers. It seems that the familiar readers were more able to project their thoughts into the situation presented by the text and consequently were more participative in the sharing of that situation because they had the same or similar experiences. This background knowledge made it possible for the readers to go beyond the text, making stronger their understanding of the text. This result is in agreement with the findings of previous research (Schank, 1975; Goetz, 1977).

STRAT 08 "Assuming a Default Interpretation and Transforming Information" was used more frequently by those students exposed to background minus passages (a mean of 15.3) than those exposed to the background plus passages (a mean of 10.15). It seems that when the pupils were confronted with text with which they were unfamiliar, they tended to make incorrect prior knowledge associations and they misconstrued the text in attempts to "make it fit" their expectations. This seems to be an acceptable strategy as readers in general evaluate the language and concepts in the text through their own language and experiences. This willingness and ability to risk such modifications would appear to be a valuable strategy (Goodman and Burke, 1980). However, this risk can be detrimental to comprehension when incorrect

associations or misinterpretations lead the reader to change his prior schema in order to accommodate present perceived input.

Hypothesis 3b

That reading proficiency will not be a factor in determining the nature of the inference strategies (N = 10) used.

The impact of reading proficiency was statistically significant for the following inferencing strategies: STRAT 03 ($p = .05$, see Table 11c), STRAT 05 ($p = .10$, see Table 11e), STRAT 06 ($p = .01$, see Table 11f), STRAT 08 ($p = .10$, see Table 11h), STRAT 07 ($p = .01$, see Table 11i), STRAT 10 ($p = .01$, see Table 11j); the null hypothesis was not rejected for STRAT 01, STRAT 02, STRAT 04, and STRAT 07 as they were not statistically significant at the .10 level of probability.

Discussion

The very proficient readers used strategies 03, 06, and 10 more frequently than the less proficient readers.

STRAT 03 "Shifting of Focus" appeared to be a strategy more associated with the very proficient readers, with a mean of 4.6 than with the less proficient readers with a mean of 2.0. It seems that when an immediate question was not resolved, the more proficient readers showed flexibility in shifting their focus to address another question within the text, thus allowing them to avoid an impasse and giving them the freedom to approach the problem from another angle.

The very proficient students attained a mean of 95.85 and the less proficient readers a mean of 79.65 on STRAT 06 "Confirming an Immediate Prior Interpretation." This result suggests that the

very proficient students were more selective of the information utilized to generate inferences thus affording them the power to consistently confirm their prior interpretations. Goodman and Burke (1980) state that the proficient reader can develop meaning through the construction of an intention that fits the text, based on additional knowledge gained through continued reading and the utilization of their own background information.

The mean use of STRAT 10 for the very proficient readers was 1.85 and .30 for the less proficient readers. STRAT 10 is "Empathizing from Experience," and it seems that the very proficient readers are either better able to relate their experiences to pertinent text information or are more inclined to expose their own experiences and opinions (or maybe both) about a situation without fear of recrimination.

The less proficient readers used strategies 05, 08, and 09 more often than the very proficient readers.

"Assigning an Alternate Case" identified as STRAT 05 was used more often by the less proficient readers with a mean of 4.95 as contrasted with a mean of 3.25 for the very proficient readers. The less proficient readers seemed to dichotomize their initial schema; they seemed to choose an alternate interpretation when new information could not be assimilated within the existing data. This finding seems to support the theory (Kintsch and Van Diyk, 1978; Calfee and Drum, 1978; Goodman, 1973) that the less proficient readers are generally more text-based and consequently tend to process the text utterance by utterance rather than interpretating subsequent data

within an overall schema.

The less proficient readers with a mean of 14.35 used more of STRAT 08 "Assuming a Default Interpretation and Transforming Information" than the very proficient readers with a mean of 11.10. Based on this finding, it would seem that the less proficient readers tend to make more assumptions based on incorrect knowledge than do the very proficient readers. The less proficient students appear to be less selective and tend to assign inappropriate associations to the textual information, oftentimes resulting in their having misconstrued the information presented in attempting to confirm a previous interpretation.

The less proficient readers also used more of STRAT 09 "Neglecting to Respond and Holding Information" with a mean number of 19.55 compared to a mean of 14.95 for the very proficient readers. It would seem then that in the face of uncertainty, the less proficient pupils lacked the confidence in themselves to hazard an interpretation of the data. Consequently, a strategy they employed was to say nothing or to repeat an earlier interpretation that they felt comfortable with, without adding any new information.

Hypothesis 4

> That there will be no interaction effects between background knowledge and reading proficiency as predictors of the nature of the inference strategies (N = 10) used.

The interaction effects were statistically significant at the .05 level of probability and the null hypothesis was rejected for STRAT 05 ($p = .05$, see Table 11e) and STRAT 08 ($p = .05$, see Table 11h). The null hypothesis was not rejected for STRAT 01, STRAT 02,

STRAT 03, STRAT 04, STRAT 06, STRAT 07, STRAT 09 and STRAT 10 as they were not statistically significant at the .10 level of probability. T-tests were used to determine differences between subgroups ($p \leq .10$).

Discussion

The less proficient reader given the background knowledge minus passages used more of STRAT 05 than the very proficient reader reading the same passages (the interaction effect is represented in Figure 15). The difference between passage type (background knowledge plus and background knowledge minus) on the use of STRAT 05 is different for the two levels of reading proficiency. Notice that as the level of reading proficiency increases from the less proficient to the very proficient the use of STRAT 05 by the readers of the background minus passages decreases, while the use of STRAT 05 on the background plus passages increases slightly.

Consider the data presented in Figure 16. Even though those students reading the background minus passages used STRAT 08 more than those students reading the background plus passages, the use was dependent upon the level of reading proficiency. The greater increase in use across readers was by the students reading the background plus passages. The greatest difference in use of this strategy was between the less proficient readers who read the unfamiliar passages and the most proficient readers who read the familiar passages, with the former group using significantly more of this strategy.

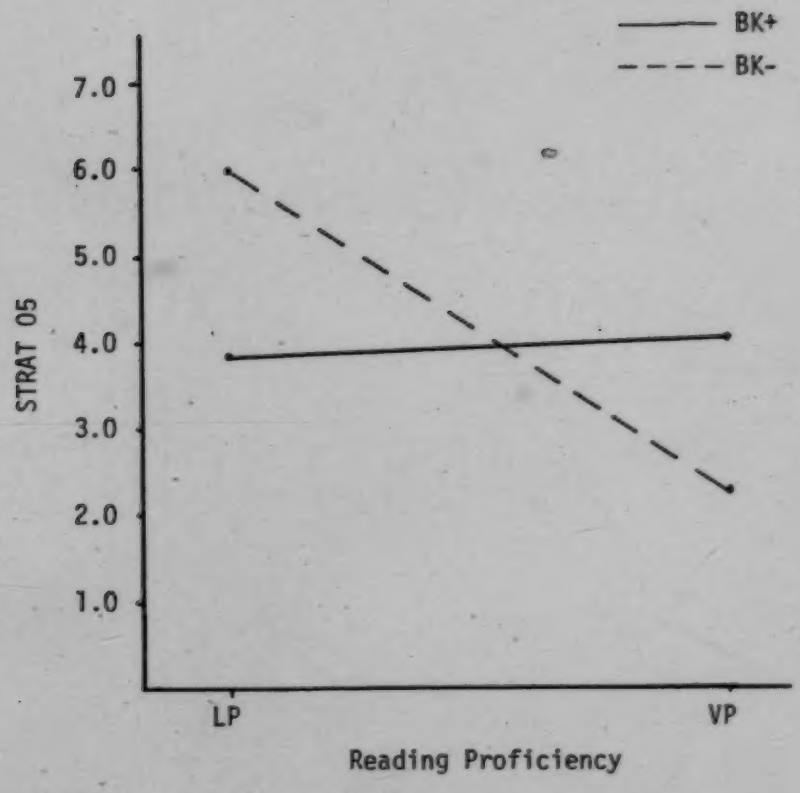


Figure 15

Graphic Representation of the Mean Scores of STRAT 05 for Background Knowledge and Reading Proficiency

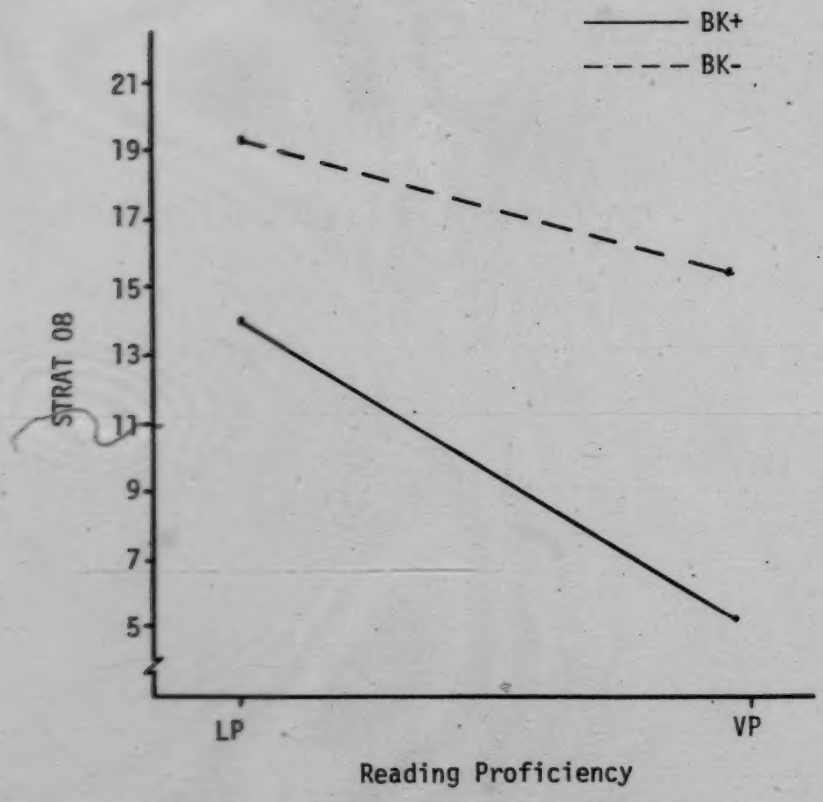


Figure 16

Graphic Representation of the Mean Scores of STRAT 08 for Background Knowledge and Reading Proficiency

Summary

A summary of the findings of those hypotheses dealing specifically with the inferencing strategies is presented in Table 12. The data here indicate that neither very proficient or less proficient students nor those reading the background knowledge plus or the background knowledge minus passages differed on the total number of inferencing strategies used. However, some differences were found when each of the inferencing strategies was analysed separately. Most differences were found between levels of reading proficiency (differences on six strategies) although the familiarity or unfamiliarity of the passages had some influence on the use of these strategies. The interaction of reading proficiency and passage familiarity determined the extent to which two of the strategies were used. These data are highlighted in Table 13.

It seems that when making inferences, students who are good readers, or who possess adequate background knowledge for the task, or both, tend to constantly confirm information that agrees with their overall schema. If information doesn't fit, the good reader can momentarily address another question and after the acquisition of further data can move back to the main topic. Possessing background knowledge allows one to project oneself into the situation and survey the problem from that point, perhaps making it possible to draw more easily on background knowledge in order to make inferences.

The student who is a less proficient reader and those possessing insufficient background knowledge use ineffective strategies. Frequently, when they can not assimilate existing data into their

Table 12

Summary of the Findings of Relationships between Background Knowledge, Reading Proficiency and the Inferencing Strategies

Null Hypotheses	Dependent Variable	Effects		
		TYPE	PROF	Interaction
1a	OTS	NR		
1b	OTS		NR	
2	OTS			NR
3a/3b/4	STRAT 01	NR	NR	NR
	STRAT 02	NR	NR	NR
	STRAT 03	NR	REJ	NR
	STRAT 04	NR	NR	NR
	STRAT 05	NR	REJ	REJ
	STRAT 06	REJ	REJ	NR
	STRAT 07	NR	NR	NR
	STRAT 08	REJ	REJ	REJ
	STRAT 09	NR	REJ	NR
	STRAT 10	REJ	REJ	NR

The Key to the Mnemonics is as Follows:

OTS = Overall Total Inference Strategies
STRAT 01 = Strategy 01 (same principle used for all 10 strategies)
TYPE = Background Plus passages or Background Minus passages
PROF = Less Proficient reader or Very Proficient reader
REJ = Null hypothesis rejected
NR = Null hypothesis not rejected.

Table 13

Summary Data for Inferencing Strategy Use According to Reading Proficiency, Background Knowledge, and the Interaction of the Two

Strategy	Students Making Greater Use		
	Level of Proficiency	Passage Type	Combined Categories
03 - Shifting Focus	R+		
05 - Assigning an Alternate Case*	R-		R-, BK-
06 - Confirming an Immediate Prior Interpretation	R+	BK+	
08 - Assuming a Default Interpretation and Transforming Information*	R-	BK-	R-, BK-
09 - Neglecting to Respond and Holding Information	R-		
10 - Empathizing from Experience	R+	BK+	

*Significant interaction effects at p = .05.

Mnemonics:

R+ = Very Proficient Reader
R- = Less Proficient Reader
BK+ = Background Knowledge Plus Passages
BK- = Background Knowledge Minus Passages

schema, they will change their schema or use a substitute schema in order to accommodate the present input. In addition, they often lack appropriate knowledge and misinterpret data, repeat information or fail to respond at all.

From the data on the interaction effects, it seems that the less proficient reader misinterprets information and fails to integrate incoming data into an existing schema when reading unfamiliar passages. This is unlike the very proficient reader who has few problems with unknown concepts on the familiar passages and who tends to relate information even if the passage is unfamiliar.

Chapter VI

FINDINGS II: HYPOTHESES RELATED TO THE SOURCE, ELABORATION AND THE LOCATION OF INFERENCES

Introduction

The findings presented in this chapter relate specifically to three factors judged to be associated with the inferencing process: the source of the inferences, the elaboration of the inferences, and the location of the inferences. This chapter is organized similarly to the previous chapter.

To coordinate the discussion of the findings, Hypotheses 5a and 7a are presented first as they relate to Source; followed by Hypothesis 5b as it relates to Elaboration; and finally by Hypotheses 6a, 6b, 7b, and 8 as they relate to Location. The means and standard deviations for each of the variables according to background knowledge and reading proficiency are presented in Table 14.

Inferencing strategies 04, 06, 09, and 10 significantly correlated with the proportion of the extralinguistic information, the dependent variable in Hypothesis 7a. Strategies 09 and 10 significantly correlated with the location of the main inference, the dependent variable in Hypothesis 7b. Thus strategies 04, 06, 09, and 10 are identified as the covariates to be used in the testing of Hypothesis 7a and strategies 09 and 10 are identified as the covariates to be used in the testing of Hypothesis 7b (see Table 8).

The covariates in the test of Hypothesis 8 are strategies 09,

Table 14

Means and Standard Deviations for Source, Elaboration, Location of Main Inference and Covariates According to Combined Groups, Background Knowledge, and Reading Proficiency

		PIEXLING	PELABEXT	LOC	STRAT 04	STRAT 06	STRAT 09	STRAT 10
Combined Groups	(N=40)	0.483 (0.092)	0.545 (0.055)	1.675 (0.474)	28.100 (12.326)	87.750 (19.422)	17.250 (5.633)	1.075 (2.043)
Background Plus	(n=20)	0.504 (0.093)	0.563 (0.063)	1.750 (0.444)	27.900 (12.506)	92.600 (22.213)	16.200 (6.420)	1.650 (2.720)
Background Minus	(n=20)	0.463 (0.089)	0.526 (0.038)	1.600 (0.503)	28.300 (12.465)	82.900 (15.210)	18.300 (4.646)	0.500 (0.688)
Very Proficient	(n=20)	0.505 (0.080)	0.559 (0.053)	1.800 (0.410)	29.900 (12.052)	95.850 (17.848)	14.950 (3.734)	1.850 (2.601)
Less Proficient	(n=20)	0.462 (0.100)	0.529 (0.053)	1.550 (0.510)	26.300 (12.641)	79.650 (17.822)	19.550 (6.329)	0.300 (0.733)

Note: The standard deviation is presented in brackets below the mean.

The Key to the Mnemonics:

PIEXLING = Proportion of Information Source that is Extralinguistic
PELABEXT = Proportion of Information Elaboration that is Extralinguistic
LOC = Location of Main Inference

Covariates #1 STRAT 04
#2 STRAT 06
#3 STRAT 09
#4 STRAT 10

10 and the proportion of the information source that is extralinguistic in the generation of inferences as these correlated significantly with the Location of the Main Inference, the dependent variable (see Table 8).

Relationships between Background Knowledge, Reading Proficiency and Source

Hypothesis 5a

> That background knowledge and reading proficiency will not be factors determining the extent to which the proportion of the information source is extralinguistic in the generation of inferences.

The influence of background knowledge and reading proficiency were not statistically significant and consequently the null hypothesis was not rejected (see Table 15).

Hypothesis 7a

> That background knowledge and reading proficiency (when strategies 04, 06, 09, and 10 are covariates) will not be factors determining the extent to which the proportion of the subject's information source for inferencing is extralinguistic.

Since the effect of STRAT 06, STRAT 09, and STRAT 10 were statistically significant (see Table 16), then the null hypothesis was rejected for these three strategies. The null hypothesis was not rejected for the three remaining factors, background knowledge, reading proficiency, and STRAT 04 as they were not statistically significant at the .10 level of probability.

Discussion

STRAT 06 (covariate #2) appears to be a powerful factor accounting for the proportion of the extralinguistic information

Table 15

Effects of Background Knowledge and Reading Proficiency on the Proportion of the Information Source that is Extralinguistic

Source of Variation	Sum of Squares	df	Mean Square	F	p
Main Effects	.035	2	.017	2.135	NS
Background Effect	.016	1	.016	2.024	NS
Proficiency Effect	.018	1	.018	2.246	NS
Interaction Effect between Background Knowledge and Reading Proficiency	.002	1	.002	.262	NS
Residual	.293	36	.008		
Total	.330	39	.008		

Table 16

Analysis of Covariance Results for the Model of the Proportion of the Information Source that is Extralinguistic

Source of Variation	Sum of Squares	df	Mean Square	F	p
Main Effects	.170	6	.028	5.878	.000
Background Effect	.000	1	.000	.001	NS
Proficiency Effect	.006	1	.006	1.325	NS
STRAT 04 (Covariate #1)	.004	1	.004	.859	NS
STRAT 06 (Covariate #2)	.025	1	.025	5.271	.028
STRAT 09 (Covariate #3)	.015	1	.015	3.129	.086
STRAT 10 (Covariate #4)	.015	1	.015	3.164	.085
Residual	.159	33	.005		
Total	.330	39	.008		

Raw Regression Coefficient (B)

STRAT 04	0.001
STRAT 06	0.002
STRAT 09	-0.004
STRAT 10	0.011

source. This means that the more often STRAT 06 is used the more extralinguistic data will be the source used in the generation of inferences. STRAT 06 has a greater influence on a subject using extralinguistic information source than the level of reading proficiency or whether the subject is familiar or unfamiliar with the passage. Further, it seems the very proficient students reading the background plus passages and using STRAT 06 (see Table 11f) were more competent in confirming their previous interpretations as they shared a degree of mutual knowledge with the text and were able to relate the two, which in turn seemed to foster a greater use of extralinguistic information to extend and enrich the meaning triggered by the text.

The master correlation matrix (Appendix J) shows a high correlation between STRAT 06 and the proportion of the information source that is extralinguistic which further supports the importance of strategy 06.

"Empathizing from Experience," STRAT 10 (covariate #4), also positively affected the greater use of extralinguistic information. While it has been previously reported (see Table 11j) that those in the background knowledge plus and very proficient categories use more of STRAT 10, this ability to project their thoughts into the situation presented by the text consequently makes the students more participative in the sharing of that situation because they have had either the same or similar experiences. The use of strategy 10 makes it possible for the readers to go beyond the text, making stronger their understanding of the text which inherently increases one's use of

extralinguistic information (source) which facilitates the making of inferences. In actual fact, in order to relate empathically to the text, a reader must be bringing outside information; consequently, the use of this strategy requires the use of extralinguistic data.

STRAT 09 (covariate #3) had a negative effect on the extent to which the proportion of the information used was drawn from beyond the text (raw beta = -.004). This means that the more often that the students use STRAT 09 "Neglecting to Respond and Holding Information," the more likely they are to rely on the information from the text only to generate inferences. In a sense then, in instances where readers lack the confidence to risk an interpretation based on prior knowledge and are repetitive, there seems to be a debilitating effect such that they are further restraining themselves in relying on text information only, which is often not sufficient for total comprehension.

Relationships between Background Knowledge, Reading Proficiency and Elaboration

Hypothesis 5b

> That background knowledge and reading proficiency will not be factors determining the extent to which the proportion of the inference elaborations are extralinguistic.

The impact of background knowledge and reading proficiency were statistically significant consequently the null hypothesis was rejected (see Table 17).

Discussion

It seems that pupils reading the background knowledge plus passages and those students classified as very proficient provide

Table 17

Effects of Background Knowledge and Reading Proficiency on the Proportion of the Inference Elaborations that are Extralinguistic

Source of Variation	Sum of Squares	df	Mean Square	F	p
Main Effects	.022	2	.011	4.364	.05
Background Effect	.013	1	.013	5.174	.05
Proficiency Effect	.009	1	.009	3.554	.10
Interaction Effect between Background and Proficiency	.003	1	.003	0.993	NS
Residual	.091	36	.003		
Total	.116	39	.003		

more extralinguistic elaborations, with the background plus passages being the most influential factor. While previous research (Hayes, 1978) has shown that good readers elaborate more than poor readers, research by Schank (1975), Anderson et al. (1977), and Reder (1978) suggests that the degree to which one elaborates depends upon previous experience or knowledge of the material. The results of the present study indicated that both reading proficiency and background knowledge were factors. It would appear the more one elaborates, then one's expectations can be activated and consequently confirmed. This type of balance is possibly related to the use of STRAT 06 by the background plus and very proficient readers as previously discussed. The correlation between STRAT 06 and the proportion of the inference elaborations that are extralinguistically based is 0.636, significant at the .000 level (see Table 8).

Relationships between Background Knowledge, Reading Proficiency and Location

Hypothesis 6a

> That background knowledge and reader proficiency will not be factors determining the location of the main inference (Early or Late).

The influence of reader proficiency on the location of the main inference was statistically significant (see Table 18) so the null hypothesis was rejected, however, the influence of background knowledge was not statistically significant so that portion of the null hypothesis was not rejected.

Hypothesis 6b

That there will be no interaction effects between background knowledge and reading proficiency in determining the location of the main inference (Early or Late).

The interaction effects were not statistically significant therefore the null hypothesis was not rejected (see Table 18).

Discussion of Hypotheses 6a and 6b

The very proficient readers made the main inference early more often than the less proficient readers irrespective of whether they were in the background plus or minus group. The very proficient readers had a mean of 1.80 as opposed to a mean of 1.55 for the less proficient readers. It would seem then that the very proficient reader is more successful and skillful in solving a problem by instantiating information earlier in a text than the less proficient reader. It seems that the former are more discriminating in their use of the textual information, which is supported by the work of Goodman and Burke (1973) who found the difference in the weak and strong readers to be in how well they have the process synchronized. It seems that the stronger readers are effective and efficient in selecting and using information. This finding also supports the notion by Gordon, Hansen and Pearson (1979) when they suggest that it is not enough just to have prior knowledge (background plus) but one must know how to use it.

Hypothesis 7b

That background knowledge and reading proficiency (when strategies 09 and 10 are the covariates) will not be factors determining the location of the main inference (Early or Late).

Table 18

Effects of Background Knowledge and Reading Proficiency on the Location of the Main Inference

Source of Variation	Sum of Squares	df	Mean Square	F	p
Main Effects	.850	2	.425	1.987	NS
Background Effect	.225	1	.225	1.052	NS
Proficiency Effect	.625	1	.625	2.922	.10
Interaction Effect between Background and Proficiency	.225	1	.225	1.052	NS
Residual	7.700	36	.214		
Total	8.775	39	.225		

The effect of STRAT 09 (covariate #1) was statistically significant (see Table 19). Thus the null hypothesis was rejected for that strategy; the null hypothesis was not rejected for the remaining factors: background knowledge, reading proficiency, and strategy 10 (covariate #2) as they were not statistically significant.

Discussion

While the whole model (main effects) was statistically significant at the .01 level, the factor accounting for most of the effect was STRAT 09. However, STRAT 09 (covariate #1) had a raw regression coefficient of -0.047 which suggests that the more use made of STRAT 09 then the less likely one is able to make the main inference early. Considering that strategy 09 "Neglecting to Respond and Holding Information" is somewhat of a counter-productive strategy then in a sense it becomes self-explanatory as to why one is less likely to make the main inference early when employing this strategy.

Hypothesis 8

> That background knowledge and reading proficiency (when strategies 09, 10, and the proportion of extralinguistic information are covariates) will not be factors in determining the location of the main inference (Early or Late).

The main effects of the complete model were statistically significant (see Table 20), however, STRAT 09 (covariate #2) made the most significant contribution to the location of the main inference, thus the null hypothesis was rejected for STRAT 09.

Table 19

Analysis of Covariance Results for the Model of the Location of the Main Inference by Background Knowledge, Reading Proficiency, and Nature of the Inference Strategy

Source of Variation	Sum of Squares	df	Mean Square	F	p
Main Effects	3.261	4	.815	5.175	.002
Background Effect	.001	1	.001	.006	NS
Proficiency Effect	.003	1	.003	.021	NS
STRAT 09 (Covariate #1)	2.181	1	2.181	13.843	.001
STRAT 10 (Covariate #2)	.152	1	.152	.962	NS
Residual	5.514	35	.158		
Total	8.775	39	.225		

Raw Regression Coefficient

STRAT 09	-0.047
STRAT 10	0.035

Table 20

Analysis of Covariance Results for the Model of the Location of the Main Inference by Background Knowledge, Reading Proficiency, Nature of the Inference Strategy, and Proportion of the Information Source that is Extralinguistic

Source of Variation	Sum of Squares	df	Mean Square	F	p
Main Effects	3.310	5	.662	4.118	.005
Background Effect	.002	1	.002	.015	NS
Proficiency Effect	.004	1	.004	.022	NS
PIEXLING (Covariate #1)	.049	1	.049	.303	NS
STRAT 09 (Covariate #2)	2.206	1	2.206	13.724	.001
STRAT 10 (Covariate #3)	.196	1	.196	1.219	NS
Residual	5.465	34	.161		
Total	8.775	39	.225		

Raw Regression Coefficient

PIEXLING	-0.450
STRAT 09	-0.049
STRAT 10	0.042

Discussion

Strategy 09 "Neglecting to Respond and Holding Information" (covariate #2) was used most frequently by the less proficient readers in the unfamiliar group. While STRAT 09 made the most significant effect on the location of the main inference, this was a negative effect (raw beta = -.149). As discussed in the previous hypothesis, strategy 09 seems to have a retarding effect such that the less use one made of STRAT 09 the more inclined one would be to make the main inference early.

Summary

A review of the findings of those hypotheses related to the inferencing process is presented in Table 21. These findings reveal that neither the very proficient pupils nor less proficient pupils grouped according to the background knowledge plus passages or minus passages differed on the proportion of the information source that was extralinguistic in nature. Rather, the factors that influenced whether students tended to rely mainly on text or on prior knowledge in making inferences were the inferencing strategies used. The use of strategies 06 and 10 by the very proficient pupils reading the background plus passages again proved to be powerful factors in facilitating the use of extratextual information. It seems that when a reader is able to confirm information compatible with his overall schema and to project himself into the situation then the use of extratextual information is promoted. The less proficient and unfamiliar student seems to depend upon less productive strategies

Table 21

Summary of the Findings of Relationships between Background Knowledge, Reading Proficiency, Source, Elaboration, and the Location of the Main Inference

Null Hypotheses	Dependent Variable	Effects						
		TYPE	PROF	Interaction	STRAT 04	STRAT 06	STRAT 09	STRAT 10
5a	PIEXLING	NR	NR					
5b	PELABEXT	REJ	REJ					
6a/6b	LOC	NR	REJ	NR				
7a	PIEXLING	NR	NR		NR	REJ	REJ	REJ
7b	LOC	NR	NR				REJ	NR
8	LOC	NR	NR				REJ	NR

Key to the Mnemonics:

TYPE = Background Knowledge (Plus or Minus Passages)
PROF = Reading Proficiency
PIEXLING = Proportion of the Information Source that is Extralinguistic
PELABEXT = Proportion of the Information Elaboration that is Extralinguistic
LOC = Location of the Main Inference (Early or Late)
NR = Null Hypothesis Not Rejected
REJ = Null Hypothesis Rejected

such that the use of strategy 09 reduced the student's chances of using extralinguistic information.

The proportion of information elaboration that was extra-linguistically based was significantly affected such that more elaboration was provided by those students in the background plus group and the more proficient category. The most influential factor as to whether students tended to rely mainly on the text or prior knowledge in making inferences was whether they were familiar with the content of the text.

The more proficient readers generally made the main inference early regardless of familiarity with the passage. This finding suggests that the better reader selectively chose and effectively used the information activated by the text to establish a congruous schema. No interaction effects between reading proficiency and background knowledge were indicated.

Background knowledge and reading proficiency were not significantly related to the location of the main inference when covariates (STRAT 09 and STRAT 10) were introduced. In fact, only strategy 09 (covariate #1) was significant (negatively). "Neglecting to Respond and Holding Information" was an impeding variable to both the identification of the main inference early and the proportion of the information source extratextually based used in the inference process.

These summary data are featured in Table 22. Thus it seems that the better readers and those in the background plus group are consistently productive. Furthermore, selected inference strategies

Table 22

Summary Data for Factors Related to Inferencing According to Background Knowledge, Reading Proficiency and Covariates (Selected Inferencing Strategies)

Variable	Factors Affecting		
	Passage Type	Proficiency	Strategies
Proportion of Information Source Extralinguistic in Nature	BK+	VP	06*, 09*, 10*
Proportion of Information Elaboration Extralinguistic in Nature	BK+*	VP*	
Location	BK+	VP*	09*

*Statistically significant effects.

(06 and 10) are major factors determining whether a student makes use of extratextual information as a source in inference generation and as a resource in extratextual inference elaboration.

The strong readers familiar with text identified the main inference early more frequently than their counterparts. Possibly this early identification expedited not only a more ready use of strategies 06 and 10 but also a greater use, thereby encouraging a confirmation of the reader's schema and fostering the use of beyond the text information in the inferencing situation. The nature of the inferencing strategies utilized by the very proficient readers emerge as important factors in the inferencing process.

Chapter VII

CONCLUSIONS AND IMPLICATIONS

Introduction

Reading comprehension is frequently defined to refer to a number of processes which are considered to be cognitive operations in the reading act manifested in the attainment of meaning. However, the magnitude of the influence of these processes on comprehension remains uncharted. While it is believed that processes identified to date perform distinct functions, empirical evidence is sparse to document such a claim.

The purpose of this study was to investigate one of the identified processes believed to be essential in reading comprehension, namely inferencing. A theory of inference was developed to provide a framework for the study. The identification of the inferencing strategies utilized by very proficient and less proficient readers with different degrees of background knowledge constituted the remainder of the study. Comparisons between the effects of background knowledge, reading proficiency, and their interactive effects on the inferencing strategies were investigated as well as other factors deemed to be related to inferencing.

This chapter presents a review of the study and a discussion of conclusions formulated from the findings. The implications of these findings will be discussed pertaining to the theory of inference,

to pedagogical practice, and finally to further research.

The Study in Review

The study was an attempt to identify the inferencing strategies used by grade six readers. One problem which faced the investigator was the lack of a coherent theory of inference. In view of the absence of such a theory, it was decided that it was essential to develop a theory which would provide a structure for the study. The information for the theory was garnered from the research and thought emanating from the disciplines of cognitive psychology, sociology, and philosophy of language synthesized with the writer's own thinking. The theory ultimately developed comprised six components: context, reading situation, writer, text, reader, and encounter.

Forty grade six students with equal numbers of boys and girls were classified into two groups (background knowledge plus and background knowledge minus) and then categorized according to their level of reading proficiency (very proficient and less proficient). Those students classified according to background knowledge plus were administered three inference passages deemed to be familiar; and those students classified according to background knowledge minus were administered the three inference passages judged to be unfamiliar. The inference passages consisting of six episodes were presented one episode at a time. As each was read by the student, he was asked to introspect and to tell the investigator what he was thinking. This interaction was tape recorded and later transcribed. The subjects'

protocols were analyzed both qualitatively and quantitatively with inter-rater reliabilities performed on all analyses. The research hypotheses pertinent to these data provided the basis for the statistical analysis. The conclusions drawn from these findings are stated in the following section.

Conclusions

Overview

It can be concluded that the results of this study were generally in agreement with the predictions of the theory of inference developed in Chapter III. Background knowledge and reading proficiency performed a role in the inferencing process; however, the inferencing strategies used manifested the most powerful influence.

Conclusion I: Total Inference Strategies

> Neither background knowledge, reading proficiency or the interaction effects of the two were found to have any significant impression on the total number of inferencing strategies used.

The first three hypotheses tested in this study disproved the predictions of the research. The finding, however, warrants further explanation in that when one considers totals only, often the essence is lost. The immediate question to be asked when totals of different groups are similar is whether the parts are the same and, in this case, whether the same inferencing strategies used by each group? Each of the ten inferencing strategies identified perform a

distinct function such that if strategy nine were used, the reader would either say nothing, or repeat a previous interpretation; whereas strategy four would allow the reader to be indefinite about an interpretation until more information was available to make his choice more specific and consistent with his prior schema. Thus a very important feature to be remembered here is that the function of each strategy differs and that different strategies are used by the two levels of readers and by both the background knowledge groups. These differences will be discussed in the following sections.

Conclusion 2: Nature of the Inferencing Strategies

> The degree of background knowledge and the level of reading proficiency were significant factors in the use of particular inferencing strategies.

A pupil's familiarity with the experimental passages demonstrated that strategies six and ten were extensively used. Through the use of strategy six a reader verified previous interpretations; whereas strategy ten entailed empathizing from personal experiences to those experiences suggested in the text. This finding suggests that when readers are acquainted with a particular subject matter and generate a particular schema on initial contact with a text then they are better prepared to extract the important cues, are better qualified to associate with the textual experiences, and consequently are more competent to coordinate the two.

Those pupils unfamiliar with the inference passages seemed to rely more on the use of strategy eight. More default interpretations appeared and more passage information was altered as the students

tried to make the text meaningful, but were unsuccessful.

Reading proficiency was more significant than background knowledge as a factor in determining which particular strategies were used. In addition to using both strategies six and ten, the very proficient readers also used more of strategy three. The less proficient reader relied more upon strategy eight and also upon two other strategies, five and nine. These findings imply that the less proficient reader is more dependent upon the textual information. Consequently when challenged with discordant information he will tend to do one of two things, either dichotomize his initial interpretation or decline to give an interpretation which adds any fresh information.

The interaction effects of background knowledge and reading proficiency on the nature of the inferencing strategies were statistically significant for strategies five and eight. Whereas readers regardless of proficiency did not differ on the use of strategy five on familiar passages, the less proficient readers used more of this strategy on unfamiliar material. Apparently when faced with this kind of passage, they found it difficult to relate information within an existing knowledge schema. In the case of strategy eight (Assuming a Default Interpretation and Transforming Information), as the level of reading proficiency decreased over a particular passage type, there was an increase in the use of this strategy on the background knowledge plus passages.

Conclusion 3: Proportion of the Inference Elaborations that are Extralinguistic

> Familiarity with text and proficiency in reading significantly influenced the number of extralinguistic elaborations used to support the inferences produced by the pupils.

Researchers (Schank, 1975; Reder, 1978) have presented and discussed research findings to corroborate this claim for these factors as influences on the extent to which readers elaborate their interpretation of text. In view of the fact that strategy six is consistently used by the very proficient student reading the background plus passages and that strategy six has a high correlation with elaborations, it seems that its potency is also evidenced in the production of extralinguistic embellishments which conform to the text.

Conclusion 4: Proportion of the Information Source that is Extralinguistic

> Neither background knowledge nor level of reading proficiency significantly affected the degree to which text information versus extratextual data was used as a source to produce inferences. Rather, particular inferencing strategies used by the readers tended to determine which source was used.

Strategies six and ten contributed to an expanded and enhanced understanding of the passages thus promoting more use of extratextual information. Thus, in order to confirm prior interpretations and to empathize with the story situation, it seemed that the reader is operating within a schema that necessitated data beyond what was supplied by the text. Strategy nine, by its very nature (Not Responding or Repeating Information), reflected the restricted use of beyond the text information because the students did not supply an interpretation which would go beyond the text.

Conclusion 5: Location of the Main Inference

> Background knowledge, level of reading proficiency and nature of the inferencing strategies significantly affected the point at which readers made the main inference (Early or Late), with reading proficiency being the most powerful influence.

It seems that the proficient reader selects information from the text which he can immediately anchor to what he already knows thus setting up expectations about the text which he can maintain, ultimately furthering his understanding of the text. The less proficient reader seemed to rely upon strategy nine (Neglecting to Respond or Holding Information) which had a negative effect on the interpreting of incoming data within an existing schema. It seems that the weak reader, even though he may possess the appropriate schema, cannot readily access text data, possibly due to an overreliance on text, a lack of confidence, or because he has habitually employed ineffective strategies.

Implications of the Findings for a Theory of Inference

In Chapter III, a theory of inference was developed and was discussed in terms of the six major components and how they would relate and function with one another. The present study was described in terms of this framework. The diagram representing this model is reproduced in Figure 17. While this model may still be used to describe the inferencing situation, modifications as a result of the present findings are suggested, although these must be considered as tentative until more research data are accumulated. There are several reasons why in this study the researcher may err in accepting

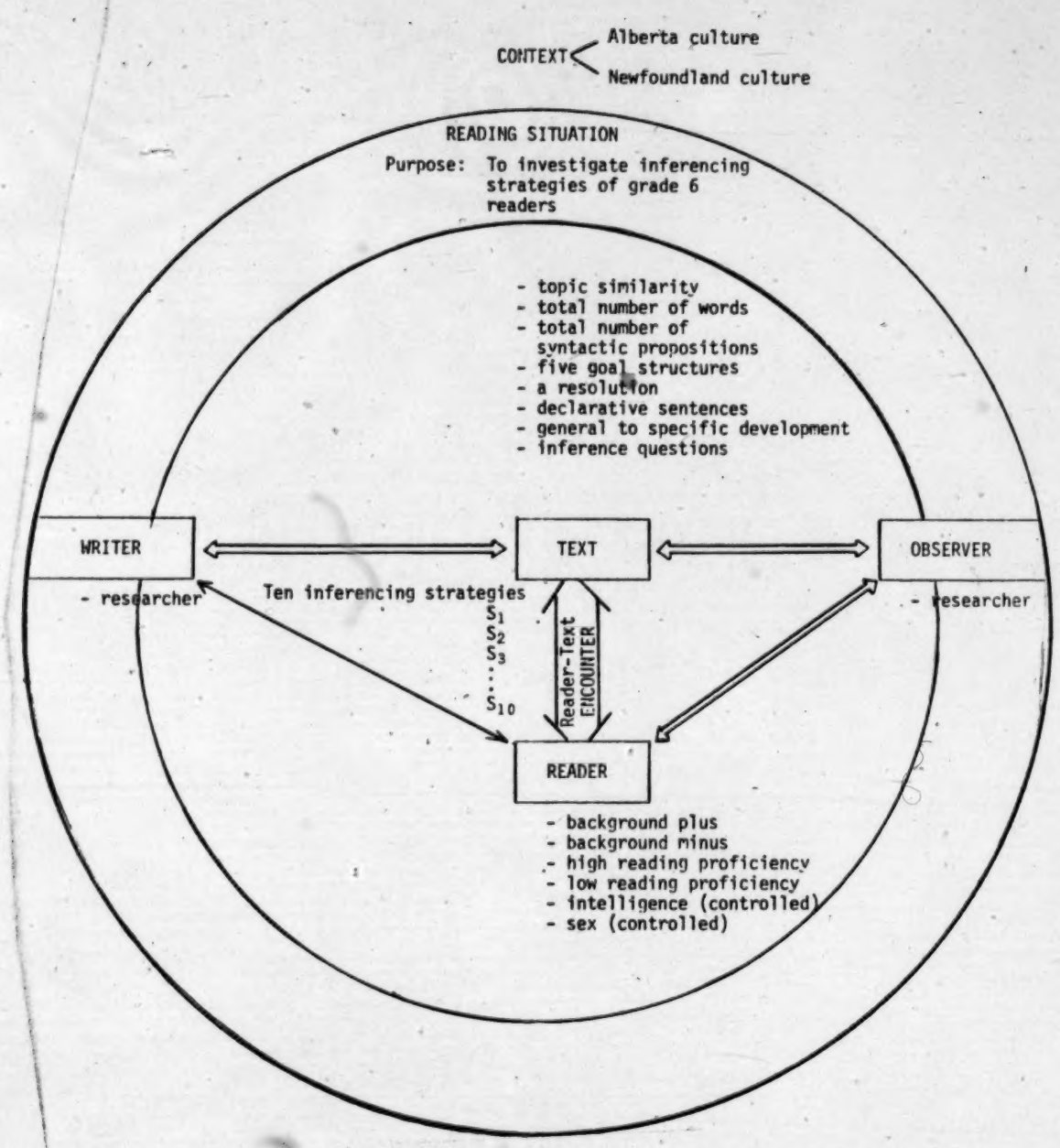


Figure 17

Reproduced Figure of Theory of Inference as Exemplified by the Present Study

hypotheses that are false; or, more likely, rejecting hypotheses that are true. Since t-test and F-ratios are sensitive to the case base, then the higher the case base the more likely the researcher will find the posited relationships statistically significant. The second reason is that the urban Alberta students may have found parallel passages on farming and fishing, skiing and randying equally "difficult," in other words the assumption that one set of passages were background knowledge minus may not have been accurate. Certain decisions were made about the Context, Reading Situation, Writer, and Text for this study. These factors were not directly tested. It may still be assumed that a Theory of Inference would include these components until at such time, data would determine otherwise. The two components—Reader and Reader-Text Encounter—were tested in this study and will be discussed in terms of their implications for a Theory of Inference.

The Reader

The present study assessed the impact of a subject's familiarity or unfamiliarity with text and a subject's level of reading proficiency on the nature of the inferencing strategies used. Intelligence and sex were controlled. Both familiarity or unfamiliarity with text and level of reading proficiency were found to be significant in determining which strategies were used. Thus the data would indicate that these two factors within the Reader component should be retained in any model of inference.

The Reader-Text Encounter

In the encounter or the coming together of the reader-text components of the model, a reader must choose from his personal experiences and knowledge, concepts that are related to the text. As suggested earlier, it is not only sufficient to have prior knowledge but a reader must also know how to use it (Gordon et al., 1979; Just and Clark, 1973; and Haviland and Clark, 1974). A reader must have the ability to extract relevant information from both his own experiences and the text and relate the two. In so doing, the reader develops, absorbs, and incorporates the two in arriving at the meaning. Ten mutually exclusive inferencing strategies were identified as being employed by the participants in the present study. Because of this finding, the researcher is not prepared at this point to discard any of these factors. Instead it is suggested that these strategies might be classified according to three types labelled as "Most Productive," "Productive," and "Counterproductive."

Most Productive Strategies. Those strategies identified as most productive are strategies three, four, six, and ten. Strategy three, "Shifting of Focus," lends flexibility to the reader such that when an immediate question cannot be answered, the reader approaches the problem from another perspective. A reader who uses strategy four, "Analyzing Alternatives," holds information tentatively in the presence of uncertainty until further information is acquired. Strategy six, "Confirming an Immediate Prior Interpretation," allows the reader to verify and consequently strengthen a previous interpretation of the text with his activated schema. This

compatibility of information between the reader and the text and between parts of the text further encourages the reader to become more participative, thus possibly allowing the reader to project himself into the reading situation ultimately resulting in the use of strategy ten, "Empathizing from Experience." All four of these effective strategies are used by the very proficient reader who seems to make greater use of them in a background plus situation.

Those strategies identified as most productive proved to be highly associated with and instrumental in influencing whether the main inference was made early or late and whether elaborations which were provided by the very proficient readers were extratextually based.

Productive Strategies. Those strategies (one, two, seven) designated as productive all serve a specific function for the reader. Strategy one serves to allow the reader to change his mind and to formulate another interpretation while strategy two permits the reader to question a previous interpretation when subsequent information suggests a conflict. On the basis of subsequent information, a reader may have to revert to an earlier interpretation which is the function served by strategy seven, "Confirming a Non-Immediate Prior Interpretation." Even though these strategies did not differentiate groups as did the other two sets of strategies, their importance should not be undermined, for frequently a reader may have to use any or all of these strategies before he can identify the appropriate schema, at which point only then is the reader able to capitalize upon those strategies identified as more effective.

Counterproductive Strategies. Those strategies identified as counterproductive are most often used by the less proficient reader and are generally more often used when the topic is unfamiliar to the reader. Strategy five, "Assigning an Alternate Case," was used when the reader was unable to fit new information within the existing data. It seemed that the reader dichotomized his schema thereby suggesting that he was working through the text in a piecemeal manner rather than working from an overall schema. Inappropriate associations to the textual information oftentimes caused the readers to stray further from the text and eventually caused them to alter the information in order to confirm their previous thoughts (strategy eight). To further render the less proficient reader unproductive was the continued use of strategy nine where the reader would either just repeat an earlier interpretation or choose to say nothing.

Data from the analyses of covariance indicated that the strategy employed is more important than either of the between-reader factors (reading proficiency and background knowledge). Thus in a Theory of Inference, the Encounter as defined by strategy seems to be the focal point.

The revised model is presented diagrammatically in Figure 18. The investigator has chosen in Figure 18 to identify only the tested elements within specific components which were statistically significant. The other components, though not tested, are still assumed to be part of a Theory of Inference.

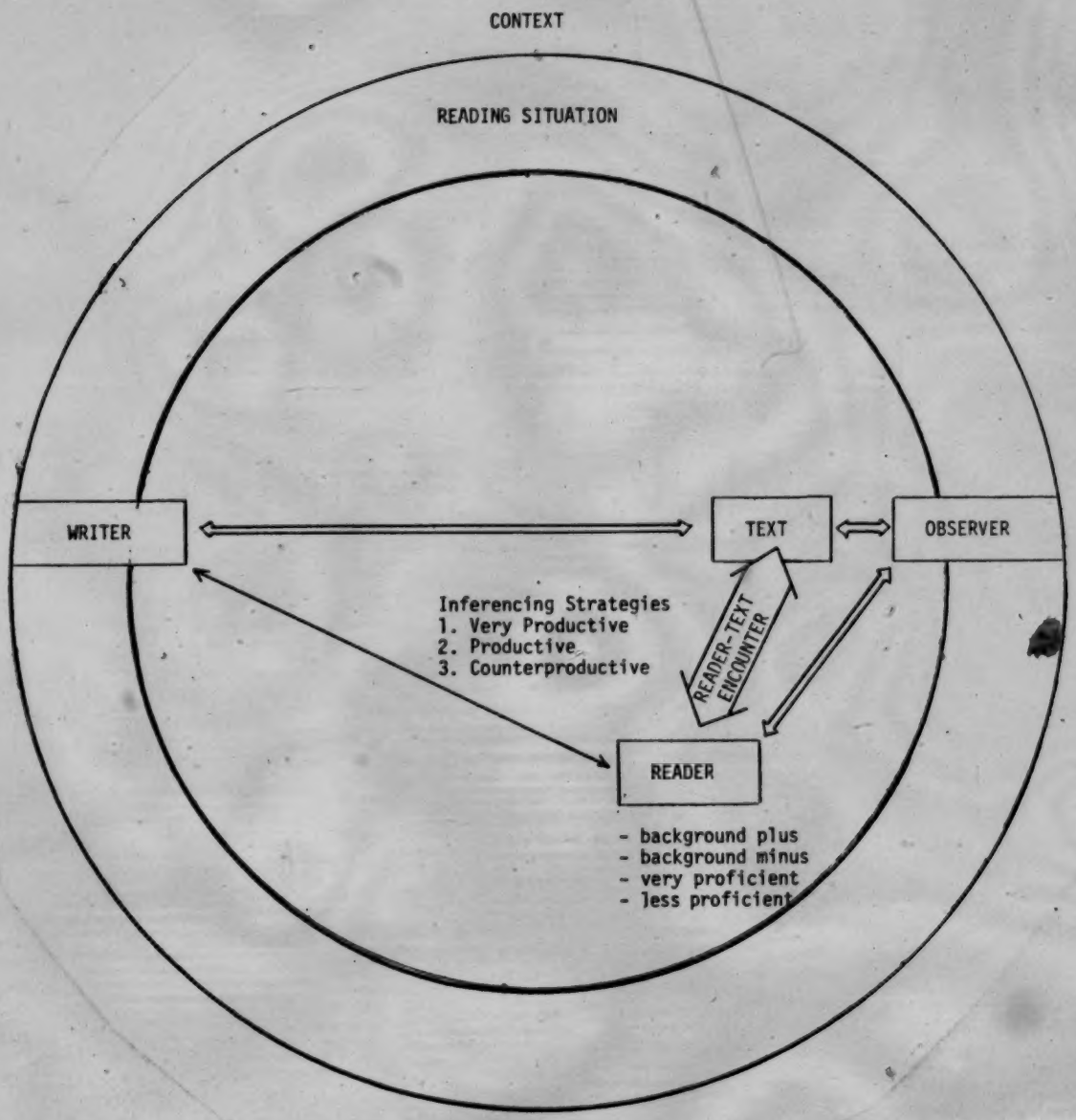


Figure 18

Revised Model of a Theory of Inference as Dictated by the Present Study

Implications for Further Research

The Theory of Inference developed in this study provided a perspective for viewing the interrelated constructs considered to be essential in the inferencing process. While the model developed suggested research questions that were tested in the present study, an added advantage of a theory is that it allows the researcher to contemplate those unexamined components. On the basis of the findings of this study and on the postulated theory, other areas where further research is necessitated have been identified and are presented as suggestions below.

Context

1. In the present study it was assumed that the subjects identified were familiar with a particular culture. This assumption could actually be tested. Subjects could be then blocked on their degree of background related knowledge, and its relationship to inferencing strategies could be investigated.

Reading Situations

2. Would the readers have employed different inferencing strategies had they been familiar with the observer (researcher)?

3. While other research has shown that the reader's purpose is important, would the inferencing strategies have differed if the readers were assigned a different purpose, for example, if they were instructed that their participation would constitute a part of their final grade or if they were allowed to set their own purpose for reading?

The Writer

4. If a reader and writer are familiar with one another and they share mutual information, does this familiarity with the writer affect the inferencing strategies a reader would use?

5. If the writer's purpose was to convey general information, would the inferencing strategies have differed?

The Text

6. Does the form of the text, that is whether the text is descriptive or rhetorical, affect the kind of inferencing strategies utilized by readers?

7. Research has shown that the degree to which a text is coherent or incoherent can affect the reader's recall of it. Would these factors also affect the reader's inferencing strategies?

8. Passages and stories directly extracted from the basal reading series would be more representative of the type of reading material children are expected to deal with, rather than the experimental passages constructed for the present study. It is recommended that the study be conducted to include materials which would more closely parallel the classroom setting.

The Reader

9. Are the inferencing strategies as identified by the present study reflective of those used by the average readers?

10. Do previous teaching methods as experienced by the readers influence the inferencing strategies they use?

11. Would the inferencing strategies used by Newfoundland

students be similar to those of the Alberta students for those passages which would correspondingly be familiar and unfamiliar for the former?

12. A sample could be chosen to include school children of various ages as they relate to the Piagetian stages of thinking. This may enhance the present understanding of inferencing as it relates to the developmental stages of thought.

The Encounter

13. Ten strategies have been identified in this study and grouped into three suggested categories. Further research is necessary to determine whether these groupings differentiate readers in various reading situations, for example, in a silent reading situation and in an uninterrupted reading situation.

Related Factors

14. The sample size should be increased to determine if the significant differences occurring in this study show a greater probability of occurrence with a larger group.

15. Students in this study were grouped according to reading proficiency which was based on a comprehension measure. Further research needs to be conducted to investigate the nature of the relationship between inferencing strategies and comprehension.

Implications of the Findings for Pedagogical Practice

The inferencing model tested several components of the Theory of Inference developed for this study. These findings and conclusions have implications for practitioners in the field. Rather than

suggesting plans for developing reading programs, the study should be seen as having identified inferencing strategies which differentiate students on the basis of their level of reading proficiency and degree of background knowledge. The researcher has suggested three category divisions for those strategies: most productive, productive, and counterproductive. It would seem that the teacher should develop within his/her students competency in the use of the most productive strategies while helping them minimize their reliance on the use of those strategies that are counterproductive. Specific suggestions are given below.

Most Productive Strategies

If the reader reaches an impasse in his reading, then the teacher may through questioning, shift his focus thus affording him the capability to view the problem from another frame of reference. The teacher should encourage the use of tentativeness while the reader is attempting to identify the overall schema by discouraging him from answering a question too quickly. The teacher may explain the use of such words as "maybe," "probably," and "could be," which do not have a restricting impact on the reader's decision. Their use suggests a degree of leeway for the reader until he can make his interpretation more definite. Only when the reader has identified the appropriate schema can expectations be productively established about the topic which he is able to confirm from the textual information. The student may be encouraged to relate his own experiences with the text by having him first state the situation as described in the text and then suggest what he would do in these circumstances. If he has had

similar experiences to those described, he could be allowed to describe them.

Counterproductive Strategies

The weak reader seems to need assistance in becoming conscious of what he already knows and of how to use this knowledge for maximum benefit, that is, the attainment of meaning in reading. A discussion concerning a particular topic prior to reading will activate relevant information for the reader, thereby setting up expectations about that topic. This prior discussion would minimize the chances of the reader making incorrect associations and interpretations, consequently reducing their use of strategy eight. The background knowledge already stored by the reader should be emphasized as being very important by suggesting that without his ideas the "book" is meaningless. This type of procedure would foster the child's self-confidence and possibly reduce his dependence upon the text. When a reader dichotomizes his initial schema and "goes off track," questions requiring him to consider how this recent information refers to what he has previously read may help him continue with a single schema. The use of strategy nine would seem to decrease as a result of asking supporting questions that provide clues to connections which the reader must make if he is to respond and progress sequentially through the text.

Authors of Reading Instructional Materials

This study has shown that "inferencing" is not a single entity but consists of a number of strategies. In reading instructional materials, readers are generally "taught" how to make inferences by merely answering inference type questions. In light of the findings of this study, this procedure does not seem adequate for enabling students to develop adequate inferencing strategies. Authors of instructional materials need to provide more specific suggestions for teaching "inferencing."

Concluding Statement

The Theory of Inference developed in this study was established to serve as a framework for the research experiment. The essential components to be considered in an inferencing situation were identified, some of which were tested. Data obtained suggest that the "Reader-Text Encounter" component was of paramount importance since selected inferencing strategies used by readers proved to be more powerful in the inferencing process than either the reader's background knowledge or level of reading proficiency.

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APPENDICES

APPENDIX A

BACKGROUND KNOWLEDGE PLUS PASSAGES

SKIING

A. The slope was covered with people. But there was room for lots more.

B. Marty's heart pounded with excitement as he raced past the chalet to join them. He was scared a little.

C. He had all new gear. He was anxious as he waited in line for the chairlift. He checked his boots and bindings.

D. The run was steep and had powder snow at the top. Marty dodged and weaved every mogul without a wipeout.

E. The steel edges saved him from crashing into the lineup.

F. Yes, skiing is a good way to spend a winter's day.

RODEO

A. Marty fumbled through his closet looking for his favorite jeans. His dad shouted that he was about to leave.

B. Marty looked again at the sky. There were still quite a few clouds.

C. Marty hoped that his dad was in a good mood because he wanted him to stop by Billy's house. Marty needed to borrow Billy's glasses.

D. They arrived early at the grounds. Marty wanted to buy some pop and hot dogs but he didn't want to miss the riders in their fancy clothes.

E. Soon the music began and the cowboys entered. Marty was now happily looking forward to the calf roping, steer wrestling and bronc riding.

F. He enjoyed the rodeo.

FARMING

A. The stillness of the morning air was broken. The thresher rattled down the field.

B. The grain was hard to cut. The heavy dew and green crop made it even more difficult. This year's yield encouraged us to try harder.

C. With the hopper full, we headed for the truck. The farmer saw gathering clouds in the north.

D. He shut down the thresher. They tied the tarp over the grain box. The truck was left in the field while we had breakfast.

E. Three more rounds were made by the farmer. The grain was unloaded with the auger.

F. Farming is filled with risk.

APPENDIX B

BACKGROUND KNOWLEDGE MINUS PASSAGES

RANDYING

A. The hill was covered with children. But there was room for lots more.

B. My heart pounded with excitement as I ran to join them. I was scared though at the thoughts of a swift ride.

C. I had a new coaster, so I had to try her out in front of my friends. I decided to go last in the train until I get the feel of it.

D. Soon the kids went home. So I was left alone to try the fastest run.

E. My rubber lumps saved me from being meshed in the pickets. I really enjoy randying in the winter.

F. Yes, sliding is a great way to spend a winter's day.

GARDEN PARTY

A. Mary Ellen and Teresa were excited as they put on their best clothes. It would soon be time to leave.

B. Teresa wanted to take a snap first. Once more she looked at the dark sky.

C. The men were setting up the stands when Mary Ellen and Teresa arrived. They wanted to get to the canteen.

D. But then they soon saw Bridie who was gaching as usual. They were glad they had left their camera at home, as she would want to be on the snaps too.

E. When Bridie wasn't looking they sneaked over to the canteen and got some refreshments. Then they enjoyed themselves taking tickets and playing different games of chance.

F. They enjoyed the Garden Party.

FISHING

A. The stillness of the morning air was broken. The men headed down the bay.

B. The net was hard to pull. The heavy sea and strong tide made it even more difficult for the girdie. The meshed catch encouraged us to try harder.

C. With four quintels aboard, we were now ready to leave. The skipper saw mares' tails in the north.

D. We tied up to the wharf. We hastily grabbed our prongs and set to work. The catch was left in the stage while we had breakfast.

E. The splitting was done by the skipper. The boys did the cutting and gutting.

F. Catching fish is filled with risk.

APPENDIX C

INFERENCE AND PROBE QUESTIONS

SKIING

A. 1. Why were the people on the slope?

*2. What were they doing? Why do you think that?

3. What questions come to mind?

So what do you think they were doing?

B. 1. Why did Marty's heart pound with excitement?

2. What questions come to mind?

So what do you think . . .

P. What do you think is going to happen next?

C. 1. Why was Marty waiting in line?

2. Why did he check his boots and bindings?

3. What questions come to mind?

So what do you think . . .

P. What do you think is going to happen next?

D. 1. Why was it important that Marty not have a wipeout? Why?

2. Why would you dodge and weave a mogul? How?

3. What questions come to mind?

So what do you think . . .

Predict.

E. 1. If A(2) is not answered—What were they doing? Why?

2. Do you think that he felt good that he did not crash into the lineup? Why?

3. Why do you think the steel edges were important? How?

F. So were you correct about what they were doing?

Depending on the responses to the above questions:

1. Why did you change your mind?

2. Why did you raise that question?

3. Why do you think that (indicating specifically) might happen? was possible?

4. What do you mean by chalet? chairlift? mogul? wipeout?

---

*Main inference.

RODEO

A. 1. Why did Marty need his jeans?

*2. Where was he going? Why do you think that?

3. What questions come to mind?

So where do you think he was going?

B. 1. Why was Marty looking at the sky?

2. What kind of weather did he want? Why?

3. What questions come to mind?

So where do you think he was going?

P. What do you think is going to happen next?

C. 1. Why did Marty think his dad would not want to stop by Billy's house?

2. Why would Marty need glasses?

3. What questions come to mind?

So where . . .

Predict.

D. 1. Why do you think Marty would miss the riders if he went to the snackbar? Why?

2. Tell me more about how the riders are dressed.

3. What questions come to mind?

So where . . .

Predict.

E. 1. If A(2) is not answered—Where was he going? Why?

2. How do you think the weather turned out? Why?

3. Do you think that Marty got to the snackbar? Why?

4. What kind of glasses were they? (if not answered)

F. So were you correct about where he was going?

Depending on the responses to the above questions:

1. Why did you change your mind?

2. Why did you raise that question?

3. What did you think that (indicating specifically) might happen? was possible?

---

*Main inference.

FARMING

A. 1. Where was the man?
*2. Where was he going? Why do you think that?
3. What questions come to mind?
So where do you think he was going?

B. 1. Why was the grain hard to cut?
2. Why was it important to get the crop off?
3. What questions come to mind?
So where . . .
P. What do you think is going to happen next?

C. 1. What was in the hopper?
2. Why were they worried about the gathering clouds?
3. What questions come to mind?
So where . . .
Predict.

D. 1. Why did he tie the tarp over the grain box?
2. Why was the truck left in the field?
3. What questions come to mind?
So where . . .
Predict.

E. 1. If A(2) is not answered—Where was he going? Why?
2. What kind of grain do you think it was?
3. What do you think they did with the grain?

F. So were you correct about where he was going?

Depending on the responses to the above questions:

1. Why did you change your mind?
2. Why did you raise that question?
3. Why do you think that (indicating specifically) might happen? was possible?
4. What do you mean by thresher? green crop? hopper? tarp? auger?

---

*Main inference.

RANDYING

A. 1. Why were the children on the hill?
*2. What were they doing?
3. What questions come to mind?
So what do you think they were doing?

B. 1. Why did the author's heart pound with excitement?
2. What questions come to mind?
So what do you think . . .
P. What do you think is going to happen next?

C. 1. Why did he have to try out his new coaster?
2. What did the author mean by "get the feel of it"?
3. What questions come to mind?
So what . . .
Predict.

D. 1. Why do you think some of the kids went home?
2. Why did he want to try the fastest run?
3. What questions come to mind?
So what . . .
Predict.

E. 1. If A(2) is not answered—What were they doing?
2. Do you think that he felt good that he did not get meshed in the pickets? Why?
3. Why do you think his rubber lumps were important?

F. So were you correct about what they were doing?

Depending on the responses to the above questions:

1. Why did you change your mind?
2. Why did you raise that question?
3. Why do you think that (indicating specifically) might happen? was possible?
4. What do you mean by randying? coaster? train? rubber lumps? meshed?

---

*Main inference.

GARDEN PARTY

A. 1. Why did Mary Ellen and Teresa want their best clothes?
*2. Where were they going? Why do you think that?
3. What questions come to mind?
So where do you think they were going?

B. 1. Why did Teresa look at the sky?
2. What kind of weather did she want? Why?
3. What questions come to mind?
So where do you think . . .
P. What do you think is going to happen next?

C. 1. Were Mary Ellen and Teresa early or late? How do you know?
2. Why did they want to get to the canteen?
3. What questions come to mind?
So where do you think . . .
Predict.

D. 1. Were Mary Ellen and Teresa glad to see Bridie? Why or Why not?
2. Would they want Bridie to go to the canteen with them? Why or Why not?
3. What questions come to mind?
So where do you think . . .
Predict.

E. 1. If A(2) is not answered—Where were they? Why?
2. What kind of prizes do you think were there?
3. What do you think Bridie did? Why?

F. So were you correct about where they were going?

Depending on the responses to the above questions:

1. Why did you change your mind?
2. Why did you raise that question?
3. Why do you think that (indicating specifically) might happen? Was possible?
4. What do you mean by snap? canteen? gaching? garden party?

---

*Main inference.

FISHING

A. 1. Where was the author?
   2. Where was he going?
   3. What questions come to mind?
   So where do you think he was going?

B. 1. Why was the net hard to pull?
   2. Why was it important for them to pull the net?
   3. What questions come to mind?
   So where do you think . . .
   P. What do you think is going to happen next?

C. 1. What was the nature of their cargo?
   2. Why were they worried about the mares' tails?
   3. What questions came to mind?
   So where do you think . . .
   Predict.

D. 1. Why did they tie up to the wharf?
   2. Why was the catch unloaded with prongs?
   3. What questions come to mind?
   So where do you think . . .
   Predict.

E. 1. If A(2) is not answered—Where was he going? Why?
   2. What kind of fish do you think they were?
   3. What do you think they did with the fish?

F. So were you correct about where he was going?

Depending on the responses to the above questions:

1. Why did you change your mind?
2. Why did you raise that question?
3. Why do you think that (indicating specifically) might happen? Was possible?
4. What do you mean by girdie? bay? heavy sea? mares' tails?

---

*Main inference.

APPENDIX D

DROPPED INFERENCE PASSAGES

SASKATOONS

A. My arms were tired from reaching the high bushes. After spending an hour in the river valley, I hadn't yet filled my pail.

B. I hadn't had much success. But I quickly forgot about that. I was glad to see a new patch.

C. The patch wasn't as big as I thought and I was very tired. Then I saw an open field with soft grass.

D. Then I noticed some high bushes at the end of the field. I thought about the jams and pies, mom would make.

E. I rushed to the end of the pasture and started picking.

F. A full pail of saskatoons was reward enough as I headed home.

BAKEAPPLES

A. My feet were sore from walking on the hard browse. After spending three hours on the open barrens, I hadn't yet filled my pail.

B. I hadn't had much success. But I quickly forgot about that. I was glad to see that nap.

C. It was pouring and so I rushed for the nap. I would be comfortable.

D. I remembered that the biggest and ripest berries usually grew best on the leeward side of the nap. I looked anxiously at the overcast sky.

E. Soon the dark sky cleared and I enjoyed berry picking for the rest of the day.

F. A full pail of bakeapples was reward enough as I headed home.

APPENDIX E

SAMPLE INFERENCE PASSAGE

SASKATOONS

A. My arms were tired from reaching the high bushes. After spending an hour in the river valley, I hadn't yet filled my pail.

B. I hadn't had much success. But I quickly forgot about that. I was glad to see a new patch.

C. The patch wasn't as big as I thought and I was very tired. Then I saw an open field with soft grass.

D. Then I noticed some high bushes at the end of the field. I thought about the jams and pies, mom would make.

E. I rushed to the end of the pasture and started picking.

F. A full pail of saskatoons was reward enough as I headed home.

SASKATOONS

A. 1. Where was the author?
*2. What was he doing? Why did you make that inference?
3. Why was he reaching for the high bushes?
4. What questions come to mind?
So what do you think he was doing?

B. 1. Why was he glad to see a new patch?
2. What questions come to mind?
So what do you think he was doing?
P. What do you think is going to happen next?

C. 1. Why was the author glad to see the field?
2. What questions come to mind?
So what do you . . .
Predict.

D. 1. Why were the high bushes important to the author?
2. Why did the author think about jams and pies?
3. What questions come to mind?
Predict.

E. 1. If A(2) is not answered—What was he doing? Why?
2. What kind of berries was he picking?
3. Why do you think it was important to fill his pail?

F. So were you correct about what he was doing?

Depending on responses to above questions:

1. Why did you change your mind?
2. Why did you raise that question?
3. Why do you think (indicating specifically) might happen? Was possible?
4. What do you mean by patch? saskatoons? pasture?

---

*Main inference.

APPENDIX F

NUMBERED INFERENCE PROTOCOL

RANDYING

A. I think they were tobogganning down the hill because of the word hill and there's children there. It's a jampacked I_1 hill because it says the hill was covered with children. There's always a crowd of children when tobogganning's good.

A3. No.

Q. So what do you think they were doing?
Tobogganning.

B. I'm thinking that someone is going to run to the hill and I_2 then go down on their toboggan because it just sounds like that's what's going to happen.

Q. What do you mean?
I dk I just got that feeling.

B1. I_3 He was excited because it's going to be a lot of fun going down the hill.

Q. Why do you think he was scared?
I_4 Cause it must have been a steep hill.

B2. I'm wondering if he's going to make it down or not.

Q. Why are you interested in that?
Well, I'd just like to know.

Q. So what do you think they were doing?
Tobogganning.

P. I can't be sure yet.

C. Well, I think he has a new toboggan or a new sled and he's going to try it out in front of his friends, he's going to go I_5 behind because he thinks his is faster than all of the others so he might pass them and then again maybe it's not as fast as theirs and they're going on ah, well they're putting their toboggans on a train.

Q. What makes you think that?
Because it says he decided to last in the train.

I_6 C1. Cause he's never used it before and he wants to try it out.

I_7 C2. Like sorta to get the feel of his coaster in the hill, like to get used to it.

C3. I wonder if he makes it down the hill.

Coaster - a new slide or toboggan.
Train - a whole bunch of toboggans in a row that go down the hill together by hanging on to the other person's toboggan.

P. I think he might go down and he might wipeout or something.

I = Inference

I_8 D. It sounds like he's going down the steepest part of the hill because it says he was going to try the fastest run. I think he's excited because I would be.

I_9 D1. Cause it's probaly getting dark or late.

I_{10} D2. He probaly hasn't tried it on his new coaster before.

D3. I need to know what happens when he goes down the steepest run.

P. He might go down and he might wipeout.

E. enjoyed (enjoy)

I_{11} I think that he might have had some padding on his coaster so he wouldn't kill himself from being meshed in the pickets.

I_{12} E2. Yeah, well I don't think it would be too much fun to get all tangled up in the pickets.

I_{13} E3. They're padding on the sides of the coaster so you won't get hurt.

Pickets - a fence.
Meshed - all tangled up.

I_{14} F. Yeah.

I = Inference

APPENDIX G

EXAMPLE OF PROTOCOL DIVIDED INTO IDEA UNITS

SKIING

A. /They're skiing/because the word slope is usually referred to in skiing/and there's lots of people on the slope/and lots of people go skiing./

A3. No.

Q. So where do you think he's going?
Skiing.

B. Ah, like/he's going to go meet them/but I'm not sure of what he's scared of./

B1. /Because maybe it was his first time./

B2. No.

Q. So where do you think he's going?
/Skiing./

Chalet - /a sorta place where you can have hot chocolate/(and stuff like that)

P. He's going to really enjoy himself.

C. /He is going skiing/and he's probaly like really anxious to go/ because it sounds like his stuff is all brand new/and he's going to try out all his stuff for the first time./

C1. /Because there's lots of people skiing/and you have to go on the chairlift to go to the top.

C2. /To make sure his skis don't fall off./

Q. What could happen if the did?
/He could do something serious to another person under him./

Q. What do you mean by something serious?
(Like)/a ski could fall/and he could really hurt somebody/ or (like) when he's up there/he could hurt himself if his skis come off./

C3. No.

Chairlift - /a chair thing you sit on when you go skiing/and it takes you up the hill./

P. They'll ski down the hill.

Key: / / Idea unit
( ) Maze and/or repetitions
_____ Relational
_____ Argument

D. waved (weaved) magule (mogul)
/He's a good skier/because he dodged everything/and didn't wipeout./

D1. So/he won't hurt himself./

Q. How could he hurt himself?
/He could twist himself around/(and stuff like that).

D2. /Because ah if you went in one/(like you sorta,)(like)/it's more of a chance that you could get hurt/because (like) if you fell you would come out, (you're) shaky/and you have a good chance to fall./

D3. No.

Wipeout - /a fall./

Mogul - /places in the hill where it's ditched/(sorta like).

P. He might go down the hill like and his new gear and everything works out great.

E. /He almost crashed into the lineup for the chairlift./ If I were there/I would've crashed into it./

E2. /Yeah,/ I dk because (like ah), if he did,/(like) "Oh, God, help me,"/(like) this is all my new stuff/and I don't want to bend any of it/(or something and like)/he could have hurt somebody else/and it wouldn't make a good run down the hill,/(like)/because he would have gone down the hill perfectly/and then he comes crashing into the people in the lineup/and then like they'd say "Hey, get out of here/what are you doing?"/and (everything and) /he'd just feel stupid./

E3. (Well),/with the steel edges that's how you stop on skis most of the time/because (like) if you didn't you wouldn't have anything to grip onto./

Q. So where are these steel edges?
/Around the edges of the skis./

F. /Yeah./

Key: / / Idea unit
( ) Maze and/or repetitions
_____ Relational
_____ Argument

APPENDIX H

EXAMPLE OF PROTOCOL WITH ASSIGNED INFERENCE STRATEGIES

FISHING

A. Well,/they're at a bay/and it's really windy outside/ no it's calm/because it's still outside/and all the ships are in port./08

Q. What are they doing?

/Probaly going out in a boat for a ride/or to go fishing./04/06

Q. So where do you think he's going?

/Fishing./06

Bay - /water where there's a lot of boats./06

B. jurdie (girdie)

/They're fishing in a boat with a net/and the mesh encouraged them to try harder./08

B1. /Because there was alot of fish in it/and alot of nets are very heavy./06

B2. /So they could get some fish./06

B3. /No./09

Q. So where do you think he's going?

/Fishing in a boat./06

Girdie - dk.09

Heavy Sea - /wavy like and really windy/very hard to move./06

P. /I don't really know./09

C. /They're going to leave/because they're finished their job/and I don't know what quintels are/and mares' tails?/03

C1. /A net,/quintels/and other things on a ship./06

Key: / / Idea unit
01, 02, 03, 04, 05, 06, 07, 08, 09, 10 = Number of inference strategies utilized.

C2. /I don't really know what mares' tails have to do with fishing./09

C3. No. 09

Q. Fishing. 06

P. DK. 09

D. /They got back to the port/ 06 and they grabbed their prongs/ 06 and scaled the fish/ 08 and like they leave it in a box, a fish container/ 06 and then they had breakfast./06

D1. /So the boat wouldn't go into the sea./06

D2. /So they wouldn't get their hands messy./06

D3. No. 09

P. They'll have a good breakfast. 06

E. Well,/they're splitting the fish open/ 06 and they're taking all the insides out of the fish./06

E2. /Maybe salmon, perch, pickerel, tuna./04/06

E3. /They're going to clean it./06

Q. What will they do with it them?

/Eat it./06

F. /Yeah./06

Key: / / Idea unit
01, 02, 03, 04, 05, 06, 07, 08, 09, 10 = Number of inference strategies utilized.

APPENDIX I

IDENTIFICATION OF IDEA UNITS USED IN ELABORATIONS

SKIING

A. (There was) a (hill) with (lots) of (people) and they're probaly tobogganning and skiing because when there's a slope you usually think of tobogganning and skiing.

A3. No.

Q. So what do you think they were doing?
Tobogganning or skiing.

B. Now I think (they're) probaly skiing because of the word (chalet). A chalet is usually at the base of the ski (slope) where you can eat or warm up after you ski.

B1. Because maybe it was the first time (he) ever went skiing.

B2. I'm wondering if it is really his first time?

Q. Why are you wondering that?
I dk I just have the feeling it isn't.

Q. So what do you think they were doing?
Skiing.

P. I think they're going to go skiing.

C. I'm positive (they're) skiing because he had (new) ski (equipment) and he was (anxious) to try it out. There was a fairly steep (hill) because it was big enough to have a (chairlift).

C1. (He) was (waiting) to go on the (chairlift) to go to the top of the (slope).

C2. To make sure (everything) was on properly.

Q. What could happen if it wasn't?
Well, (he) might be on the (chairlift) and they could (fall) off or if the bindings were too tight and he fell, he could break a leg.

C3. I'm still wondering if it's the first time he skied.

Chairlift - Well, it's a chair that's pulled up the hill.

P. He might have trouble getting on or off the chairlift if it's his first time.

Key to Coding: _____ Key Concepts
( ) Concepts from Text.

D. I know (it's) not (his) first time skiing because he (dodged) and (weaved) (every) (mogul) (without) a (wipeout), at least when I started skiing I couldn't do that.

D1. (He) could hurt himself.

Q. How?
Well, he could break a leg or something.

D2. If you (don't) then you have to jump over (them) instead of going around them and believe me you eventually fall.

D3. No.

Wipeout - a fall.
Mogul - a built-up mound of snow on the ski slope.

P. He'll probaly get to the bottom and want to go up again.

E. Well, (he) had good (steel) (edges) on his skis and he was going down really fast because he almost (crashed) (into) the (lineup).

E2. Yes, (he) would have been embarrassed if he had (crashed) into the (lineup) after making it down the (slope) (without) a (wipeout).

E3. Because (they) provide a good grip into the ice and snow for stopping easily.

F. Yes.

Key to Coding: _____ Key Concepts
( ) Concepts from Text.

APPENDIX J

MASTER CORRELATION MATRIX

MASTER MATRIX, CORRELATION COEFFICIENTS FOR VARIABLES USED IN THE STUDY

Variables	TYPE	PROF	SEX	IQ	VOCAB	COMP	OTS	ILING	IEXLING	LOC	ELABIT	ELABEXT	STRAT 01	STRAT 02
TYPE	1.000													
PROF	0.0	1.000												
SEX	0.0	0.0	1.000											
IQ	-.214	.043	-.322	1.000										
VOCAB	.073	.942	-.081	.036	1.000									
COMP	.068	.948	-.102	.127	.915	1.000								
OTS	-.046	.184	.243	-.223	.117	.186	1.000							
ILING	.140	-.154	.210	-.139	-.147	-.295	-.371	1.000						
IEXLING	-.266	.255	0.0	-.021	.142	.331	.651	-.775	1.000					
LOC	-.160	.267	-.267	-.002	.235	.330	-.132	-.201	.152	1.000				
ELABIT	-.220	.252	.210	-.097	.133	.247	.616	-.183	.580	.043	1.000			
ELABEXT	-.402	.335	-.070	.069	.248	.385	.652	-.689	.892	.180	.658	1.000		
STRAT 01	-.081	-.081	.190	-.159	-.145	-.073	.125	.060	.130	-.033	.308	.098	1.000	
STRAT 02	-.142	-.028	.199	.354	-.069	-.038	-.020	.052	.048	-.171	-.065	-.047	.238	1.000
STRAT 03	-.012	.319	.282	-.306	.387	.300	.381	-.084	.095	-.132	.098	.156	-.031	-.141
STRAT 04	-.016	.148	.177	-.146	.123	.161	.911	-.343	.515	-.056	.491	.542	-.002	-.009
STRAT 05	0.0	-.264	-.016	.058	-.256	-.172	.166	-.139	.061	-.028	.260	.080	.035	.142
STRAT 06	-.253	.422	.005	-.142	.390	.424	.791	-.441	.727	.102	.593	.778	.041	-.206
STRAT 07	-.137	-.159	.308	-.442	-.298	-.186	.165	-.037	.205	.085	.248	.159	.251	-.122
STRAT 08	.375	-.237	-.011	.167	-.317	-.189	-.055	.149	-.149	-.160	-.079	-.262	.186	.202
STRAT 09	.189	-.414	.351	-.202	-.421	-.527	.096	.351	-.299	-.593	-.138	-.367	-.011	.172
STRAT 10	-.285	.384	.161	-.021	.321	.360	.278	-.480	.394	.290	.097	.447	-.056	-.119
PIEXLING	-.223	.235	-.096	.052	.169	.344	.555	-.928	.953	.200	.431	.849	.045	.022
PELABEXT	-.336	.279	-.254	.151	.260	.361	.407	-.782	.767	.210	.142	.828	-.082	-.013

Note: The underlined coefficients were statistically significant at the $p < .10$ level.

The Key to the Mnemonics:

TYPE = Passages BK+, BK-
PROF = Reading Proficiency
VOCAB = Vocabulary
COMP = Comprehension
OTS = Overall Total Inferencing Strategies
ILING = Information source linguistic-based inferences
IEXLING = Information source extralinguistic based inferences
LOC = Location of main inferences
ELABIT = Elaboration information linguistic-based
ELABEXT = Elaboration information extralinguistic-based
STRAT 01 = Strategy one
PIEXLING = Proportion of information source extralinguistic-based
PELABEXT = Proportion of elaboration extralinguistic-based.

Master Matrix (continued)

STRAT 03	STRAT 04	STRAT 05	STRAT 06	STRAT 07	STRAT 08	STRAT 09	STRAT 10	PIEXLING	PELABEXT	Means	SD
										1.500	.506
										1.500	.506
										1.500	.506
										107.600	4.722
										68.250	25.799
										67.425	26.630
										163.375	30.383
										21.500	3.623
										20.250	4.372
										1.675	.474
										134.625	24.261
										166.025	48.853
										.725	.933
										3.950	1.782
1.000										3.300	4.128
.314	1.000									28.100	12.326
-.134	.163	1.000								4.100	3.257
.376	.644	-.092	1.000							87.750	19.422
.129	.081	.321	-.073	1.000						3.150	4.447
-.467	-.006	-.029	-.372	-.166	1.000					12.725	6.947
-.108	.036	.028	-.269	.040	.242	1.000				17.250	5.633
.223	.223	-.113	.390	.072	-.373	-.260	1.000			1.075	2.043
.094	.467	.107	.636	.143	-.165	-.353	.456	1.000		.483	.092
.118	.356	-.063	.582	.043	-.260	-.392	.500	.821	1.000	.545	.055